FEBRUARY
1950

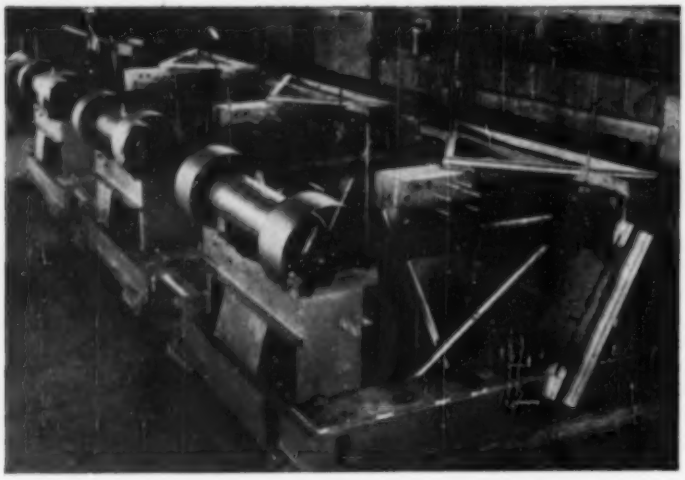
Chemical Engineering

WITH CHEMICAL & METALLURGICAL ENGINEERING

ARMOUR'S NEW FATTY ACID PLANT IS HIGH WATER MARK IN A FAST MODERNIZING INDUSTRY. FEATURE ARTICLE PAGE 124

A McGraw-Hill Publication

One Dollar



This torture rack assures you stronger flanges

PIPE LINES are *live, dynamic* members of a piping system. They *breathe* with changes in temperature and pressure. And the danger of fatigue failure from pressure shock, thermal shock, and cyclic conditions is ever-present

More precise information was needed on this subject. So, Tube Turns research engineers set out to get the answers. For the purpose, they designed and built a unique cyclic testing machine to handle full-size piping assemblies under a wide range of temperature, pressure, and corrosive conditions. And on this torture rack they subjected flanged assemblies to reverse bending tests carried on to ultimate failure. Information revealed forms the basis of new designs for greater strength in Tube-Turn Welding Flanges.

This test is typical of many conducted constantly by the Tube Turns research and development organization . . . the finest in the welding fittings business. This perpetual search for improved welding fittings and flanges assures you of top quality at all times when you deal with Tube Turns!

Write for free copy of Paper 49-S-6 titled "Fatigue Tests on Flanged Assemblies."

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TUBE TURNS, INC.

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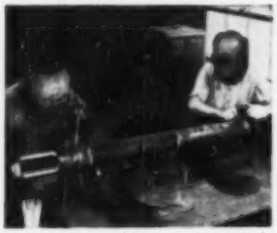
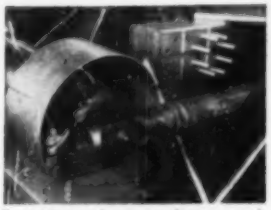
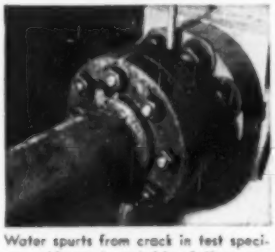
HOW THE FATIGUE TEST WORKS



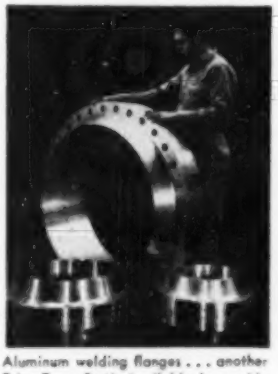
This test assembly comprises 4-inch standard weight pipe and 300-lb. forged steel flanges.



Eccentric crank arm produces up-and-down movement which creates a cyclic bending moment on flange or fitting at opposite end of assembly.



Water spurts from crack in test specimen. Almost invariably, failure occurred in the pipe adjacent to the flange.



Aluminum welding flanges . . . another Tube Turns first! Available in a wide range of types and sizes.

PACIFIC PROCESS INDUSTRIES **PPI** *A Section of Chemical Engineering*
FEBRUARY 1950 *Vol. 57, No. 2*

PACIFIC EDITION, CHEMICAL ENGINEERING . . . . PACIFIC COAST EDITOR: J. V. Hightower, *San Francisco* . . . . EDITORIAL ASSISTANT: Elizabeth Allen, *San Francisco* . . . . SPECIAL CORRESPONDENTS: W. S. Shamban, Kenneth D. Kahn, Jr., *Los Angeles*; Ray Bloomberg, *Seattle* . . . . MANAGING EDITOR: L. B. Pope, *New York*

Your PPI Directory

Recognizing the need for a compilation of western chemical processors, the editors of PPI have undertaken the job and have come up with this directory of western chemical and chemical process industries.

So far as we know it is the first such regional survey. It is a guide to what companies are making what types of products—and where—in each of the 11 Western States. As such it reflects the industrial economies in those states and indicates where markets for, and source of, various chemicals are to be found. It supplements the PPI Directory of Prime Producers of Chemicals published in October 1948 and is intended to show where consumers of chemicals are operating.

Many companies manufacture products having several major applications or being capable of classification under more than one heading. For this reason the names of such companies will be found distributed at various points in the directory, all of which should be examined if it is desired to get a broad picture of the scope of such firms.

The list could have been extended to other classes of chemical processors and may be enlarged later. However, an arbitrary line had to be drawn somewhere short of the point of exhaustiveness, else the effort to include all categories of those who use chemicals would have required an amount of time and space that was not available.

It was the objective of the work to include, within the categories presented, those firms with manufacturing operations in the West up to the time of this issue. Sources of information include private companies and individuals, state and federal government agencies, chambers of commerce, trade associations, other local or regional industrial development groups, and educational institutions or their affiliates. As might be expected, the amount and apparent reliability of information obtained from the different states varied markedly. A process of selection based on the apparent best evidence had to be adopted.

Some errors of omission and commission are probably present. Corrections will be welcomed. When writing, please keep in mind that the directory concerns only the 11 Western States and those companies having actual manufacturing operations in those states. Letters should give the name of the company, name of the nearest town or locality where each manufacturing plant is situated, types of products made at each plant, and principal applications of each product. Write the Pacific Coast Editor, Chemical Engineering, 68 Post St., San Francisco.

Directory of Western Chemical and Chemical Process Industries

ADHESIVES

Adhesive Products, Inc. Albany, Calif.
American-Marietta Co. Seattle, Wash.
Arabol Mfg. Co. San Francisco, Calif.
Avery Adhesives Los Angeles, Calif.
Avoset Co. Gustine, Calif.
Balfour-Guthrie, Ltd. Seattle, Wash.
Borden Co. Springfield, Ore.
Consolidated Chemical Industries, Inc. San Francisco, Calif.
Dewey and Almy Chemical Co. San Leandro, Calif.
Diamond Alkali Co. Emeryville, Calif.
Harbor Plywood Corp. Hoquiam, Wash.
M & M Woodworking Co. Portland, Ore.
Monsanto Chemical Co. Seattle, Wash.
Muirson Label Co., Inc. San Jose, Calif.
Narmco, Inc. San Diego, Calif.
Philadelphia Quartz Co. of Calif. Tacoma, Wash.
Philadelphia Quartz Co. of Calif. Berkeley, Calif.
Philadelphia Quartz Co. of Calif. South Gate, Calif.
Puget Sound Pulp & Timber Co. Bellingham, Wash.
Swift & Co. Portland, Ore.
Swift & Co. Los Angeles, Calif.
Waterside Milling Co. Tacoma, Wash.
West Coast Plywood Co. Hoquiam, Wash.

BLEACHING AGENTS

American-Marietta Co. Los Angeles, Calif.
Clorite Chemical Co. Phoenix, Ariz.
Clorox Chemical Co. Oakland, Calif.
Clorox Chemical Co. Los Angeles, Calif.
Crown Products Co. San Francisco, Calif.
Crown Products Co. Los Angeles, Calif.
Patek & Co., Inc. San Francisco, Calif.
Pennsylvania Salt Mfg. Co. Tacoma, Wash.
Purex Corp., Ltd. South Gate, Calif.
Purex Corp., Ltd. Tacoma, Wash.
Sun Valley Mfg. Corp. Phoenix, Ariz.
Table Products Co. Vernon, Calif.
Wasatch Chemical Co. Salt Lake City, Utah
White Rose Chemical Co. Salem, Ore.

CHEMICALS, INORGANIC

Acids

Amecco Chemicals, Inc. Henderson, Nev.
American Smelting & Refining Co. Selby, Calif.
American Smelting & Refining Co. Garfield, Utah
American Smelting & Refining Co. Tacoma, Wash.
Anaconda Copper Mining Co. Anaconda, Mont.
Anaconda Copper Mining Co. Great Falls, Mont.
Apache Powder Co. Benson, Ariz.
Dow Chemical Co. Pittsburg, Calif.
E. I. duPont de Nemours & Co. Louviers, Colo.
E. I. duPont de Nemours & Co. DuPont, Wash.
Food Machinery & Chemical Corp. Newark, Calif.
General Chemical Co. Richmond, Calif.
General Chemical Co. El Segundo, Calif.
General Chemical Co. Nichols, Calif
General Chemical Co. Denver, Colo.
Garfield Chemical & Mfg. Co. Garfield, Utah
Gates Bros. Wendell, Idaho
Hercules Powder Co. Hercules, Calif.
Hooker Electrochemical Co. Tacoma, Wash.
International Smelting & Refining Co. Miami, Ariz.
International Smelting & Refining Co. Toole, Utah
A. R. Maas Chemical Co. South Gate, Calif.
Montrose Chemical Co. of Calif. Henderson, Nev.
New York-Ohio Chemical Co. Domingues, Calif.
Pacific Coast Borax Co. Wilmington, Calif
Phelps Dodge Corp. Douglas, Ariz.
Phelps Dodge Corp. Ajor, Ariz.
Stauffer Chemical Co. Vernon, Calif.
Stauffer Chemical Co. Domingues, Calif.
Stauffer Chemical Co. Torrance, Calif.
Stauffer Chemical Co. Richmond, Calif.
Stauffer Chemical Co. San Francisco, Calif.
Stauffer Chemical Co. Las Vegas, Nev.

Alkalis

American Potash & Chemical Corp. Trona, Calif.
California Soda Co. Oakland, Calif.
Clorox Chemical Co. Oakland, Calif.
Colorado Fuel & Iron Co. Denver, Colo.
Dow Chemical Co. Pittsburg, Calif.
General Chemical Co. Nichols, Calif.
General Chemical Co. Denver, Colo.
George, G. N. Co. Los Angeles, Calif.
Food Machinery & Chemical Corp. Westvaco, Wyo.
Hercules Powder Co. Hercules, Calif.
Hooker Electrochemical Co. Tacoma, Wash.
International Minerals & Chemical Corp. Carlsbad, N. M.
Iowa Soda Products Co. Rawlins, Wyo.
A. R. Maas Chemical Co. South Gate, Calif.
Natural Soda Products Co. Keeler, Calif.

Alkalis, cont.

Pennsylvania Salt Mfg. Co.	Portland, Ore.
Pennsylvania Salt Mfg. Co.	Tacoma, Wash.
Pittsburgh Plate Glass Co.	Bartlett, Calif.
Shell Chemical Co.	Shell Point, Calif.
Stauffer Chemical Co.	Las Vegas, Nev.
West End Chemical Co.	West End, Calif.
Zehrung Chemical Co.	Portland, Ore.

Chlorine

Clorox Chemical Co.	Oakland, Calif.
Colorado Fuel & Iron Co.	Denver, Colo.
Dow Chemical Co.	Pittsburg, Calif.
Hooker Electrochemical Co.	Tacoma, Wash.
Pennsylvania Salt Mfg. Co.	Portland, Ore.
Pennsylvania Salt Mfg. Co.	Tacoma, Wash.
Stauffer Chemical Co.	Las Vegas, Nev.

Aluminum Compounds

Dow Chemical Co.	Pittsburg, Calif.
General Chemical Co.	El Segundo, Calif.
General Chemical Co.	Nichols, Calif.
General Chemical Co.	Denver, Colo.
General Chemical Co.	Vancouver, Wash.
Leffingwell Co.	E. Whittier, Calif.
New York-Ohio Chemical Co.	Domingues, Calif.
New York-Ohio Chemical Co.	Henderson, Nev.
Oronite Chemical Co.	Richmond, Calif.
Stauffer Chemical Co.	Richmond, Calif.
Stauffer Chemical Co.	Portland, Ore.

Ammonia, Ammonium Compounds

Atlas Powder Co.	Giant, Calif.
Best Fertilizer Co.	Oakland, Calif.
Colorado Fuel & Iron Co.	Denver, Colo.
Colorado Fuel & Iron Co.	Pueblo, Colo.
Columbia Metals Corp.	Salem, Ore.
Columbia Powder Co.	Tacoma, Wash.
Columbia Steel Co.	Geneva, Utah
Columbia Steel Co.	Provo, Utah
Dow Chemical Co.	Pittsburg, Calif.
E. I. duPont de Nemours & Co.	DuPont, Wash.
E. I. duPont de Nemours & Co.	Tacoma, Wash.
Farm Service Co.	Oakland, Calif.
General Chemical Co.	Nichols, Calif.
General Chemical Co.	Denver, Colo.
Geneva Steel Co.	Geneva, Utah
Geneva Steel Co.	Ironton, Utah
Hercules Powder Co.	Hercules, Calif.
Kaiser Steel Corp.	Fontana, Calif.
Pacific Coast Borax Co.	Wilmington, Calif.
Shell Chemical Co.	Shell Point, Calif.
Simplot Fertilizer Co.	Salt Lake City, Utah
Western Electrochemical Co.	Henderson, Nev.

Arsenic Compounds

American Smelting & Refining Co.	Garfield, Utah
American Smelting & Refining Co.	Tacoma, Wash.
Anaconda Copper Mining Co.	Anaconda, Mont.
Chipman Chemical Co.	Palo Alto, Calif.
General Chemical Co.	Nichols, Calif.
Jardine Mining Co.	Jardine, Mont.
U. S. Smelting & Refining Co.	Midvale, Utah

Barium Compounds

Arizona Barite Co.	Mesa, Ariz.
Barium Products, Ltd.	Modesto, Calif.
Chemical & Pigment Co.	Oakland, Calif.
Coulter, Harden & Co.	Henderson, Nev.
Leffingwell Co.	E. Whittier, Calif.

Calcium Compounds, Excl. of Lime

California Rock Salt Co.	Amboy, Calif.
California Spray Chemical Corp.	Richmond, Calif.
Coulter, Harden & Co.	Henderson, Nev.
Desert Properties Co.	Amboy, Calif.
Electro Metallurgical Corp.	Portland, Ore.
Food Machinery & Chemical Corp.	Newark, Calif.
General Chemical Co.	Nichols, Calif.
Hill Bros. Chemical Co.	Amboy, Calif.
Morris P. Kirk & Son, Inc.	Los Angeles, Calif.
Los Angeles Chemical Co.	Los Angeles, Calif.
Mullett Island Salt Works	Niland, Calif.
National Chlorides Co.	Amboy, Calif.
Pacific Carbide & Alloys Co.	Portland, Ore.
United States Borax Co.	Shoshone, Calif.
Utah Lime & Stone Co.	Salt Lake City, Utah
West End Chemical Co.	West End, Calif.

Copper Compounds

Bunker Hill & Sullivan Mining & Concentrating Co.	Kellogg, Idaho
California Flaxseed Products Co.	Vernon, Calif.
California Ink Co.	Berkeley, Calif.
California Spray-Chemical Corp.	Richmond, Calif.
Leffingwell Co.	E. Whittier, Calif.
Los Angeles Chemical Co.	South Gate, Calif.
Moberg Laboratories	Los Angeles, Calif.
Mountain Copper Co., Ltd.	Martinez, Calif.
Oronite Chemical Co.	Richmond, Calif.
Phelps Dodge Corp.	Douglas, Ariz.
Reaction Products Co.	Richmond, Calif.

Magnesium Compounds

Barium Products, Ltd.	Modesto, Calif.
Coulter, Harden & Co.	Henderson, Nev.
Desert Properties Co.	Amboy, Calif.
Food Machinery & Chemical Corp.	Newark, Calif.
Hill Bros. Chemical Co.	Amboy, Calif.
Johns-Manville Products Corp.	Pittsburg, Calif.
Johns-Manville Products Corp.	Redwood City, Calif.
Kaiser Aluminum & Chemical Corp.	Moss Landing, Calif.
Kaiser Aluminum & Chemical Corp.	Natividad, Calif.
Marine Magnesium Products Corp.	S. San Francisco, Calif.
Northwest Magnesite Co.	Chehalis, Wash
Paraffine Cos., Ltd.	Emeryville, Calif.

Potassium Compounds

American Potash & Chemical Co.	Trona, Calif.
Deepwater Chemical Co.	Compton, Calif.
Dow Chemical Co.	Seal Beach, Calif.
Industrial Chemical Supply Co.	Los Angeles, Calif.
International Minerals & Chemical Corp.	Carlsbad, N. M.
Pennsylvania Salt Mfg. Co.	Portland, Ore.
Potash Co. of America	Carlsbad, N. M.
U. S. Potash Co.	Carlsbad, N. M.

Salt

American Salt Co.	Mt. Eden, Calif.
California Rock Salt Co.	Amboy, Calif.
Crystal White Salt Co.	Saltair, Utah
I. N. Curtis	Salt Lake, N. M.
Dale Chemical Industries	Dale Lake, Calif.
Great Western Salt Co.	Redmond, Utah
International Minerals & Chemical Co.	Carlsbad, N. M.
The Irvine Co.	Tustin, Calif.
Leslie Salt Co.	Newark, Calif.
Long Beach Salt Co.	Cantil, Calif.
Monterey Bay Salt Works	Moss Landing, Calif.
Morton Salt Co.	Newark, Calif.
Morton Salt Co.	Saltair, Utah
New Mexico Salt Co.	Willard, N. M.
Oliver Bros. Salt Co.	Mt. Eden, Calif.
Potash Co. of America	Carlsbad, N. M.
Poulson Bros. Salt Co.	Redmond, Utah
Royal Crystal Salt Co.	Saltair, Utah
Western Salt Co.	San Diego, Calif.

Sodium Compounds, Excl. Salt

American Potash & Chemical Co.	Trona, Calif.
American Smelting & Refining Co.	Tacoma, Wash.
Dale Chemical Industries	Dale Lake, Calif.
Diamond Alkali Co.	Emeryville, Calif.
Dow Chemical Co.	Pittsburg, Calif.
Food Machinery & Chemical Corp.	Newark, Calif.
General Chemical Co.	Nichols, Calif.
General Chemical Co.	El Segundo, Calif.
Industrial Chemical Supply Co.	Los Angeles, Calif.
Iowa Soda Products Co.	Rawlins, Wyo.
Kaiser Aluminum & Chemical Corp.	Owens Lake, Calif.
Los Angeles Chemical Co.	Los Angeles, Calif.
A. R. Maas Chemical	South Gate, Calif.
Nevada Chemical Co.	Mina, Nev.
Pennsylvania Salt Mfg. Co.	Portland, Ore.
Philadelphia Quartz Co. of Calif.	Berkeley, Calif.
Philadelphia Quartz Co. of Calif.	South Gate, Calif.
Pittsburg Plate Glass Co.	Bartlett, Calif.
Wm. E. Pratt	Casper, Wyo.
Stauffer Chemical Co.	San Francisco, Calif.
Stauffer Chemical Co.	Vernon, Calif.
West End Chemical Co.	West End, Calif.

Zinc Compounds

American Smelting & Refining Co.	Selby, Calif.
Bunker Hill & Sullivan Mining & Conc. Co.	Kellogg, Idaho
California Pacific Chemical Co.	El Segundo, Calif.
California Spray Chemical Corp.	Richmond, Calif.
Chemical & Pigment Co.	Oakland, Calif.
Morris P. Kirk & Son	Los Angeles, Calif.
Leffingwell Co.	E. Whittier, Calif.
Pacific Smelting Co.	Torrance, Calif.

Ferro-Alloys

Anaconda Copper Mining Co.	Grant Falls, Mont.

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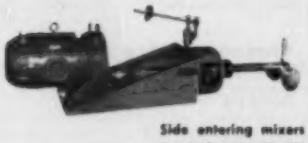

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Chromium Mining & Smelting Corp. Spokane, Wash.
Electro-Metallurgical Co. Portland, Ore.
Food Machinery & Chemical Corp. Pocatello, Idaho
Keokuk Electro-Metals Co. Wenatchee, Wash.
Ohio Ferro-Alloys Corp. Tacoma, Wash.

Rare Metal Chemicals, Reagents

Anaconda Copper Mining Co. Anaconda, Mont.
Research Chemicals, Inc. Burbank, Calif.
Rocky Mountain Research, Inc. Denver, Colo.
S. W. Shattuck Chemical Co. Denver, Colo.
U. S. Vanadium Corp. Bishop, Calif

Elemental Non-Metallics, Excl. Carbon & Gases

American Potash & Chemical Corp. Trona, Calif.
Dow Chemical Co. Seal Beach, Calif.
Deepwater Chemical Co. Compton, Calif.
Food Machinery & Chemical Corp. Pocatello, Idaho
Hancock Chemical Co. Long Beach, Calif.
Stanolind Oil & Gas Co Powell, Wyo.
Texas Gulf Sulphur Co. Worland, Wyo.

Inorganic Chemicals, NEC

American Smelting & Refining Co. Leadville, Colo.
American Smelting & Refining Co. Denver, Colo.
American Smelting & Refining Co. Tacoma, Wash.
Arizona Minerals Corp. Yuma, Ariz.
Bradley Mining Co. Stibnite, Idaho
Culligan Zeolite Co. San Bernardino, Calif.
Harshaw Chemical Co. El Segundo, Calif.
Los Angeles Water Softener, Inc. Los Angeles, Calif.
A. R. Maas Chemical Co. South Gate Calif.
Metropolitan Water District of S. Calif. La Verne, Calif.
Miami Copper Co. Miami, Ariz.
Pittsburgh Plate Glass Co. Bartlett, Calif.
Portland Shingle Co. Portland, Ore.
U. S. Steel Co. Pittsburg, Calif.
West End Chemical Co. West End, Calif.

CHEMICALS, ORGANIC

Acids, Amino

Dow Chemical Co. Pittsburg, Calif.
HM Chemical Co., Ltd. Los Angeles, Calif
International Minerals & Chemical Corp. San Jose, Calif.
Nelson-Wells & Co. Los Angeles, Calif.
Van Camp Laboratories Terminal Island, Calif.

Acids, Naphthenic & Naphthenates

California Flaxseed Products Co. Vernon, Calif.
California Ink Co. Berkeley, Calif.
Colorado Fuel & Iron Co. Pueblo, Colo.
H. J. Fouts & Co. Los Angeles, Calif.
General Petroleum Corp. Vernon, Calif.
Los Angeles Chemical Co. South Gate, Calif.
Oronite Chemical Co. El Segundo, Calif
Oronite Chemical Co. Richmond, Calif.

Acids, Other, Esters

General Foods, Birdeye's Div. Los Angeles, Calif.
Commercial Solvents Corp. Agnew, Calif.
El Dorado Oil Works Oakland, Calif.
Exchange Lemon Products Co. Corona, Calif.
Exchange Orange Products Co. Ontario, Calif.
Griffin Chemical Co. Richmond, Calif.
W. C. Hardesty & Co. Los Angeles, Calif.
Kelco Co., Inc. San Diego, Calif.
Lac Chemicals, Inc. Culver City, Calif.
Mutual Citrus Products Co. Anaheim, Calif.
Western Condensing Co. Gustine, Calif.
Western Condensing Co. Portland, Ore.

Chlorinated Hydrocarbons

Ameeco Chemicals, Inc. Henderson, Nev.
Dow Chemical Co. Pittsburg, Calif.
Eston Chemicals, Inc. Vernon, Calif.
Hooker-Detrex Co. Tacoma, Wash.
Shell Chemical Corp. Martinez Calif.
Montrose Chemical Co. of Calif. Henderson, Nev.

Drugs, Medicines, Pharmaceuticals

Abbott Laboratories Seattle, Wash.
Allergy Research Laboratories, Inc. Phoenix, Ariz.
American Agar & Chemical Co. San Diego, Calif.
S. O. Barnes & Son Gardena, Calif.
Barnett Laboratories Long Beach, Calif.
Don Baxter, Inc. Glendale, Calif.
Bedwell Laboratories Los Angeles, Calif.
Bio-Products Oregon, Ltd. Astoria, Ore.
Boyle & Co. Los Angeles, Calif.
Colorado Serum Co. Denver, Colo.
Cutter Laboratories Berkeley, Calif.
Dawes Mfg. Co. Auburn, Wash.
Dow Chemical Co. Pittsburg, Calif.
Enayco, Inc. San Pedro, Calif.
Exchange Lemon Products Corona, Calif.
Exchange Orange Products Ontario, Calif.
Franco Laboratories Nogales, Ariz.
Galen Co. Richmond, Calif.
Hanck Laboratories Portland, Ore.
Harrower Laboratory, Inc. Glendale, Calif.
HM Chemical Co. Los Angeles, Calif.
Hyland Laboratories Los Angeles, Calif.
International Minerals & Chemical Corp. San Jose, Calif.
Kelco Co., Inc. San Diego, Calif.
Kuster Laboratories, Inc. San Carlos, Calif.
E. C. Leintz Co. Fillmore, Calif.
Lyle Branchflower Co. Seattle, Wash.
E. S. Miller Laboratories, Inc. Los Angeles, Calif.
Monarch Manufacturing Co. Maywood, Calif.
Nassau Chemicals, Inc. Sebastapol, Calif.
Nelson-Wells & Co. Los Angeles, Calif.
Nion Corp. Los Angeles, Calif.
Nutrilite Products Co. Buena Park, Calif.
Paschall Laboratories Seattle, Wash.
Research Laboratories Seattle, Wash.
Rexall Drug Co. Los Angeles, Calif.
Riders, Ltd. Hollywood, Calif.
Rubin Co. Vernon, Calif.
R. R. Rogers Chemical Co. San Francisco, Calif.
Scott & Gilbert Co. San Francisco, Calif.
Shumates Drug Co. San Francisco, Calif.
S-K Research Laboratories Phoenix, Ariz.
Spicer-Gerhart Co. Sunland, Calif.
Stauffer Chemical Co. San Francisco, Calif.
Stayner Corp. Berkeley, Calif.
Sterol Derivatives, Inc. Alhambra, Calif.
Upjohn Co. San Francisco, Calif.
Valley Dehydrating Co. Kingsburg, Calif.
Van Camp Laboratories Terminal Island, Calif.
Vitaminerals, Inc. Los Angeles, Calif.
Vitamin Technologists, Inc. Los Angeles, Calif.
Vitamin Institute Hollywood, Calif.
Washington Laboratories Seattle, Wash.

Fine Organics

Arapahoe Chemicals, Inc. Boulder, Colo.
Frontier Chemical Co. Azusa, Calif.
Research Laboratories Burbank, Calif.

Soaps, Metallic

California Flaxseed Products Co. Vernon, Calif.
California Ink Co. Berkeley, Calif.
Hercules Powder Co. Portland, Ore.
Kelco Co. San Diego, Calif.
Lellingwell Co. East Whittier, Calif.
Mountain Copper Co. Martinez, Calif.
Zehrung Chemical Co. Portland, Ore.

Solvents: Benzene, Aromatics

Colorado Fuel & Iron Co. Denver, Colo.
Colorado Fuel & Iron Co. Pueblo, Colo.
Columbia Steel Co. Geneva, Utah
Columbia Steel Co. Provo, Utah
Crown Tar & Chemical Works Denver, Colo.
Fond Chemical Co. Los Angeles, Calif.
Geneva Steel Co. Geneva, Utah
Geneva Steel Co. Ironton, Utah
Kaiser Steel Corp. Fontana, Calif.
Oronite Chemical Co. Richmond, Calif.
Phillipson Retort Mfg. Co. Eugene, Ore.
Portland Gas & Coke Co. Portland, Ore.
Seattle Gas Co. Seattle, Wash.
Shell Chemical Co. Shell Point, Calif.
Shell Chemical Co. Dominguez, Calif.

Solvents: Industrial Alcohol

Commercial Solvents Corp. Agnew, Calif.
Lac Chemicals, Inc. Culver City, Calif.
Puget Sound Pulp & Timber Co. Bellingham, Wash.
U. S. Industrial Chemicals, Inc. Anaheim, Calif.

Solvents: Misc.

Dow Chemical Co. Pittsburg, Calif.
Lac Chemicals, Inc. Culver City, Calif.
Shell Chemical Co. Martinez, Calif.
Shell Chemical Co. Dominguez, Calif.

Surface-Active Agents, Excl. Soaps

California Chemical Co. San Bernardino, Calif.
El Dorado Oil Works Oakland, Calif.
Fond Chemical Co. Los Angeles, Calif.
Griffin Chemical Co. Richmond, Calif.
Oronite Chemical Co. Richmond, Calif.

COKE OVEN PRODUCTS

Colorado Fuel & Iron Co. Denver, Colo.
Colorado Fuel & Iron Co. Pueblo, Colo.
Columbia Steel Co. Geneva, Utah
Columbia Steel Co. Provo, Utah
Geneva Steel Corp. Geneva, Utah
Geneva Steel Corp. Ironton, Utah
Kaiser Steel Corp. Fontana, Calif.
Northwest Cities Gas Co. Walla Walla, Wash.
Geo. Oravetz & Son Auburn, Wash.
Phillipson Retort Mfg. Co. Eugene, Ore.
Portland Gas & Coke Co. Portland, Ore.
Records Coal Processing Co. Wellington, Utah
Seattle Gas Co. Seattle, Wash.
Storrs Int'l. Chemical & Refining Co. Salt Lake City, Utah
Western Chemical & Refining Co. Provo, Utah

EXPLOSIVES, PYROTECHNICS

Aerojet Engineering Corp. Azusa, Calif.
Atlas Powder Co. Giant, Calif.

IN THE WEST FOR THE WEST!

Westvaco

AGAIN PIONEERS IN PHOSPHATES

First unit of Westvaco elemental Phosphorus plant at Pocatello, Idaho. Second unit now in production. Both are supplied from rich deposits of phosphate shale nearby.

Ever since 1886 Westvaco and its immediate predecessor companies have pioneered in phosphates.

Now—in a series of coordinated advances—Westvaco poses the expansion of the Western chemical industry *with the first and only integrated production of phosphates West of the Mississippi.*

New swinging into production is the *second unit* of our elemental Phosphorus plant at Pocatello, Idaho. Rapidly nearing completion at Newark, California are new conversion facilities for sizeable production of phosphates.

In conjunction with our Soda Ash development at Westvaco, Wyoming, these substantial investments are the best possible evidence of our faith in the expanding future of the West . . . and our desire to grow with it by serving the West from the West.

For delivery from our Newark, California plant we solicit inquiries for:

SODIUM TRIPOLYPHOSPHATE
TETRASODIUM PYROPHOSPHATE
TETRAPOTASSIUM PYROPHOSPHATE
ACID SODIUM PYROPHOSPHATE
MONOSODIUM PHOSPHATE
MONOPOTASSIUM PHOSPHATE
DISODIUM PHOSPHATE
DIPOTASSIUM PHOSPHATE
TRIPOTASSIUM PHOSPHATE

Westvaco CHEMICALS

WESTVACO CHEMICAL DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION
GENERAL OFFICES • 405 LEXINGTON AVENUE, NEW YORK 17
CHICAGO, ILL. • CLEVELAND, OHIO • CINCINNATI, OHIO
ST. LOUIS, MO. • LOS ANGELES, CALIF. • NEWARK, CALIF.

fmc

Explosives, cont.

California Cap Co. Richmond, Calif.
Coast Mfg. & Supply Co. Livermore, Calif.
Columbia Powder Co. Fredrickson, Wash.
Crown Match Co. Los Angeles, Ca..f.
Diamond Match Co. Chico, Calif.
E. I. du Pont de Nemours & Co., Inc. Louviere, Colo.
E. I. du Pont de Nemours & Co., Inc. Du Pont, Wash.
Hercules Powder Co. Hercules, Calif.
Hercules Powder Co. Bacchus, Utah
Hitt Fireworks Co. Seattle, Wash.
Illinois Powder Mfg. Co. Spanish Fork, Utah
National Fuse & Power Co. Denver, Colo.
Pacific Match Co. Tacoma, Wash.
Pacific Powder Co. Tenino, Wash.
Pacific Railway Signal Co. Los Gatos, Calif.
Trojan Powder Co. San Lorenzo, Calif.
West Coast Powder Co. Everett, Wash.
Western Electrochemical Co. Henderson, Nev.
Western Fireworks Co. Denver, Colo.

FERTILIZERS

Nitrogen

Colorado Fuel & Iron Co. Denver, Colo.
Colorado Fuel & Iron Co. Pueblo, Colo.
Columbia Powder Co. Fredrickson, Wash.
Columbia Steel Co. Provo, Utah
Columbia Steel Co. Geneva, Utah
Dow Chemical Co. Pittsburg, Calif.
E. I. du Pont de Nemours & Co., Inc. Du Pont, Wash.
E. I. du Pont de Nemours & Co., Inc. Tacoma, Wash.
Farm Service Co. Oakland, Calif.
Geneva Steel Co. Geneva, Utah
Geneva Steel Co. Ironton, Utah
Hercules Powder Co. Hercules, Calif.
Kaiser Steel Corp. Fontana, Calif.
Shell Chemical Co. Shell Point, Calif.
Simplot Fertilizer Co. Salt Lake City, Utah

Phosphorus

Anaconda Copper Mining Co. Anaconda, Mont.
Gates Bros., Inc. Wendell, Idaho
Gelatine, Inc. Henderson, Nev.
Kaiser Aluminum & Chemical Corp. Permanente, Calif.
Lodi Fertilizer Co. Farmington, Utah
Manganese Products, Inc. Seattle, Wash.
Simplot Fertilizer Co. Salt Lake City, Utah
Simplot Fertilizer Co. Pocatello, Idaho
Stauffer Chemical Co. Vernon, Calif.
Stauffer Chemical Co. Tacoma, Wash.
Sunland Industries, Inc. Fresno, Calif.

Potash

American Potash & Chemical Corp. Trona, Calif.
Bonneville, Ltd. Wendover, Utah
Dow Chemical Co. Pittsburg, Calif.
International Minerals & Chemical Corp. Carlsbad, N. M.
Potash Co. of America Carlsbad, N. M.
U. S. Potash Co. Carlsbad, N. M.

Mixed Goods

Agricultural Chemicals Co. Phoenix, Ariz.
Alexander Film Co. Colorado Springs, Colo.
Arizona Fertilizers, Inc. Phoenix, Ariz.
Bandini Fertilizer Co. Los Angeles, Calif.
Best Fertilizer Co. Oakland, Calif.
Capital Fuel & Seed Co. Phoenix, Ariz.
Carstens Packing Co. Tacoma, Wash.
Crop King Co. Yakima, Wash.
J. W. Dunn Co. Seattle, Wash.
Galbraith & Co. Seattle, Wash.
Growers Chemical Supply Co. Azusa, Calif.
Inland Fertilizer Co. Los Angeles, Calif.
C. Jamieson Portland, Ore.
Chas. H. Lilly Co. Seattle, Wash.
Magnolia Fertilizer Co. Seattle, Wash.
Marine Byproducts Co. Portland, Ore.
Marine Byproducts Co. Seattle, Wash.
Mecker-Hughes Co. Salem, Ore.
Miller Products Co. Portland, Ore.
Oregon-Washington Fertilizer Co. Portland, Ore.
Oregon-Washington Fertilizer Co. Seattle, Wash.
Pacific Guano Co. Berkeley, Calif.
Pacific Guano Co. Los Angeles, Calif.
Southern California Fertilizer Co. Los Angeles, Calif.
Spokane Fertilizer Co. Spokane, Wash.
Swift & Co. Los Angeles, Calif.
Swift & Co. Portland, Ore.
Taylor Milling Corp. Stockton, Calif.
Tovrea Fertilizer Co. Phoenix, Ariz.
Tucson Fertilizer Co. Tucson, Ariz.
Webfoot Fertilizer Co. Portland, Ore.
Wilbur Ellis Co. Seattle, Wash.
Woodburn Fuel & Supply Co. Woodburn, Ore.
Yakima Valley Spray Chemical Co. Yakima, Wash.

GLASS, CERAMICS, ABRASIVES

Glass

Anchor Hocking Glass Co. Los Angeles, Calif.
Atlas Imperial Diesel Engine Co. Hayward, Calif.
Ball Bros. Co. El Monte, Calif.
Brock Glass Co., Ltd. Santa Ana, Calif.
Crown Glass Works Arcadia, Calif.
Denver Glass Bottle Co. Denver, Colo.
A. H. Forgar & Co. Los Angeles, Calif.
Glass Containers, Inc. Los Angeles, Calif.
Glass Containers, Inc. Antioch, Calif.
Hayward Optical Glass Co. Whittier, Calif.
Hazel-Atlas Glass Co. Oakland, Calif.
Alexander H. Kerr & Co. Santa Ana, Calif.
Latchford-Marble Glass Co. Huntington Park, Calif.
Maywood Glass Co. Los Angeles, Calif.
Mississippi Glass Co. Fullerton, Calif.
Northwestern Glass Co. Seattle, Wash.
Owens-Corning Fiberglas Corp. Santa Clara, Calif.
Owens-Illinois Glass Co. Oakland, Calif.
Owens-Illinois Glass Co. Los Angeles, Calif.
Technical Glass Co., Inc. Los Angeles, Calif.
T. E. Thal Gardena, Calif.

Brick, Pottery, Tile

Abrahamson Brick Co. Seattle, Wash.
American Clay Works & Supply Co. Denver, Colo.
Arizona Pottery Co. Phoenix, Ariz.
Atkinson Brick Co. Los Angeles, Calif.
J. A. Bauer Pottery Co. Los Angeles, Calif.
Bestile Manufacturing Co. Ontario, Calif.
Bevin Kilns Sierra Madre, Calif.
Blake Bros. Richmond, Calif.
Builders Brick Co., Ltd. Los Angeles, Calif.
Builders Brick Co. Seattle, Wash.
California Art Tile Co. Richmond, Calif.
California Pottery Co. Niles, Calif.
Chehalis Brick & Tile Co. Chehalis, Wash.
Clark Brick Co. Denver, Colo.
Clark & Sons Alameda, Calif.
Columbia Brick Works Portland, Ore.
Delta Brick & Tile Co. Delta, Colo.
Denver Sewer Pipe & Clay Co. Denver, Colo.
Denver Terra Cotta Co. Denver, Colo.
Desert House Crafts, Inc. Tucson, Ariz.
Desert Kilns Co. Scottsdale, Ariz.
Diamond Fire Brick Co. Canon City, Colo.
Dorothy Kindalls Pottery Laguna Beach, Calif.
Durango Brick Works Durango, Colo.
Everett Brick Yard Everett, Wash.
Farrey Brick Co. Denver, Colo.
Farris Concrete Products Co. Greeley, Colo.
Ft. Collins Brick & Tile Co. Ft. Collins, Colo.
Garden City Pottery Co. San Jose, Calif.
Garden of Gods Pottery Colorado Springs, Colo.
Gladding, McBean & Co. Pittsburg, Calif.
Golden Fire Brick Co. Golden, Colo.
Grand Junction Brick Co. Grand Junction, Colo.
Granger Clay Products Co. Granger, Wash.
Great Falls Brick Co. Great Falls, Mont.
Heller Pottery Co. Colorado Springs, Colo.
Higgins Brick & Tile Works Manteca, Calif.
Higgins Brick & Tile Works Santa Monica, Calif.
Hollydale Pottery Hollywood, Calif.
Hutchinson Co. El Cerrito, Calif.
Hyland Brick Co. Denver, Colo.
Idaho Falls Brick & Tile Co. Idaho Falls, Idaho
Inland Concrete Products Co. Moscow, Idaho
Interstate Brick Co. Salt Lake City, Utah
Lakewood Brick & Tile Co. Denver, Colo.
Lakewood Pottery Co. Lakewood, Colo.
Laurel Potteries Stockton, Calif.
Lewistown Brick Yard Lewistown, Mont.
Longmont Brick & Tile Co. Longmont, Colo.
Lorentzen Co. Oakland, Calif.
Los Angeles Brick Co. Alberhill, Calif.
Los Angeles Brick Co. Elsinore, Calif.
Los Angeles Pottery Lynwood, Calif.
Max Weill of Calif. Los Angeles, Calif.
Mutual Materials Co. Seattle, Wash.
Mineral Products Corp. Seattle, Wash.
Mohave Ceramic Co. Chloride, Ariz.
Myers Ceramic Products Co. Santa Clara, Calif.
National Clay Products Co. Colorado Springs, Colo.
Ogden Pressed Brick Tile Co. Ogden, Utah
Overland Pressed Brick Co. Denver, Colo.
Pacific Clay Products Stockton, Calif.
Pacific Clay Products Alameda, Calif.
Pacific Clay Products Los Angeles, Calif.
Pacific Clay Products Los Nietos, Calif.
Padre Potteries Los Angeles, Calif.
Panama Pottery Co., Inc. Sacramento, Calif.
Pomona Tile Mfg. Co. Los Angeles, Calif.
Pomona Tile Mfg. Co. Pomona, Calif.
Port Costa Brick Works Port Costa, Calif.
Pueblo Pottery Tucson, Ariz.
Remillard Dandini San Jose, Calif.
Rio Hondo Pottery Co. El Monte, Calif.
San Joaquin Brick Co. Stockton, Calif.
San Jose Brick & Tile Co. San Jose, Calif.
Santa Anita Potteries Los Angeles, Calif.
Shaffer Brick & Tile Co. Lowell, Wash.
Sleepy Hollow Pottery Laguna Beach, Calif.
Southern California Ceramic Co. Santa Monica, Calif.
Suman Potteries Sierra Madre, Calif.
Summit Pressed Brick & Tile Co. Pueblo, Colo.
Tabor Uttley Pottery Co. Colorado Springs, Colo.
Trinidad Brick & Tile Co. Trinidad, Colo.
Union Brick Co. San Diego, Calif.
United Materials & Rich Brick Co. Richmond, Calif.
Van Briggle Art Pottery Co. Colorado Springs, Colo.
Vernon Potteries, Ltd. Los Angeles, Calif.
Victoria Ceramics San Juan Capistrano, Calif.
Vitrified Brick & Tile Co. Walsenburg, Colo.
Joseph H. Walker Monrovia, Calif.
Wallace China Co., Ltd. Huntington Park, Calif.
Washington Brick & Lime Co. Dishman, Wash.
Western Clay Mfg. Co. Helena, Mont.
Willamina Clay Products Co. Willamina, Ore.
Walter Wilson Pasadena, Calif.
Zia Pottery Co. Phoenix, Ariz.

Refractories

Basic Refractories, Inc. Gabbs, Nev.
Davidson Brick Co. Los Angeles, Calif.

Stauffer
CHEMICALS
SINCE 1885

You Profit

"Any container for any acid"—Stauffer now can offer the widest possible selection of the most modern type of containers for the delivery of industrial acids. By specifying the type and size of container that best suits your needs you can *profit* by cutting down on waste materials, greater ease of handling, and by keeping a minimum quantity of material in inventory.

Leading the Stauffer "package parade" is the scientifically designed Stauffer stainless steel drum, which features handholds on side and bottom, engineered pouring spout, and top air vent. This drum for Nitric Acid, with these special features, available *only* through Stauffer.

Specialists in the manufacture of quality-controlled acids, specialists in obtaining the finest possible containers for these acids, the Stauffer Chemical Company offers you the finest acids in the widest selection of containers.

SULPHURIC ACID Available in:
5, 6½, 13 gallon glass carboys
55 gallon steel drums
Tank trucks
Tank cars

NITRIC ACID Available in:
5, 6½, 13 gallon glass carboys
8½ gallon stainless steel drums
55 gallon stainless steel drums
Tank trucks
Tank cars

MURIATIC ACID Available in:
5, 6½, 13 gallon glass carboys
Tank trucks
Tank cars

STAUFFER CHEMICAL COMPANY

Sales Offices

SAN FRANCISCO NORTH PORTLAND, ORE. LOS ANGELES
CHICAGO AKRON HOUSTON APOPKA, FLA. NEW YORK

Refractories, cont.

Denver Fire Clay Co. Denver, Colo.
Diamond Firebrick Co. Canon City, Colo.
Ensco Refractories Co. Lehi, Utah
General Refractories Co. Los Angeles, Calif.
General Tile Corp. El Segundo, Calif.
Gladding, McBean & Co. Pittsburg, Calif.
Kaiser Aluminum & Chemical Corp. Moss Landing, Calif.
Murray Refractories Co. Murray, Utah
Pacific Tile & Porcelain Co. Hynes, Calif.
Pioneer Brick Works Canon City, Colo.
Robinson Brick Co. Denver, Colo.
San Valle Tile Kilns Los Angeles, Calif.
Simmons Brick Co. Los Angeles, Calif.
Standard Firebrick Co. Pueblo, Colo.
Utah Fire Clay Co. Salt Lake City, Utah
Valley Brick & Supply Co. Van Nuys, Calif.
Wallapai Brick & Clay Products Co. Phoenix, Ariz.
Western Gold & Platinum Works San Francisco, Calif.
Western Refractories Co. Ione, Calif.

Porcelain, Other Misc.

Ceramics

American Chain & Cable Co., Inc. San Francisco, Calif.
American Radiator & Standard Sanitary Co. San Pablo, Calif.
E. J. Bartells Co. Portland, Ore.
Basalt Rock Co. Healdsburg, Calif.
Bevin Kilns Sierra Madre, Calif.
Cannon & Co. N. Sacramento, Calif.
Coors Porcelain Co. Golden, Colo.
Crystal Silica Co. Oceanside, Calif.
Granite Rock Co. Watsonville, Calif.
Hallenscheid & McDonald Los Angeles, Calif.
Kennedy Minerals, Inc. Los Angeles, Calif.
Lorentsen Co. Oakland, Calif.
Metlox Mfg. Co. Manhattan Beach, Calif.
Otto Buchner Co. Salt Lake City, Utah
Standard Porcelain Products, Inc. Culver City, Utah
Technical Porcelain & Chinaware El Cerrito, Calif.
Winfield Pottery Pasadena, Calif.

Abrasives

Carborundum Co. Vancouver, Wash.
Pacific Grinding Wheel Co. Everett, Wash.
William Palmberg Los Angeles, Calif.

INDUSTRIAL GASES

Acetylene

Acetylene Co. of Utah Salt Lake City, Utah
Acetylene Service Co. Denver, Colo
Air Reduction Pacific Co. Berkeley, Calif.
Air Reduction Pacific Co. Vernon, Calif.
Air Reduction Pacific Co. Portland, Ore.
Air Reduction Pacific Co. Seattle, Wash.
Burdett Oxygen Co. of Calif. Los Nietos, Calif.
Dye Oxygen Co. Phoenix, Ariz.
Industrial Air Products Medford, Ore.
Industrial Air Products Portland, Ore.
Industrial Air Products Spokane, Wash.
Inland Oxygen-Acetylene Co. Spokane, Wash.
Linde Air Products Co. Phoenix, Ariz.
Linde Air Products Co. Tucson, Ariz.
Linde Air Products Co. San Francisco, Calif.
Linde Air Products Co. Los Angeles, Calif.
Linde Air Products Co. Stockton, Calif.
Linde Air Products Co. Denver, Colo.
Linde Air Products Co. Boise, Idaho
Linde Air Products Co. Billings, Mont.
Linde Air Products Co. Butte, Mont.
Linde Air Products Co. Albuquerque, N. M.
Linde Air Products Co. Portland, Ore.
Linde Air Products Co. Salt Lake City, Utah
Linde Air Products Co. Seattle, Wash.
Linde Air Products Co. Spokane, Wash.
National Cylinder Gas Co. Los Angeles, Calif.
National Cylinder Gas Co. Portland, Ore.
National Cylinder Gas Co. Seattle, Wash.
Pacific Acetylene Co. San Diego, Calif.
Pacific Carbide & Alloys Co. Portland, Ore.
Pacific Oxygen Co. Oakland, Calif.
Portland Oxygen Co. Portland, Ore.
Seattle Oxygen Co. Seattle, Wash.
Stuart Oxygen Co. Oakland, Calif.
Stuart Oxygen Co. Hanford, Calif.
Stuart Oxygen Co. Portland, Ore.
Western Oxygen Co. Seattle, Wash.

Carbon Dioxide

Caldri Ice Corp. Hopland, Calif.
California Carbonic Co. Los Angeles, Calif.
Carbo Chemical Co. Salt Lake City, Utah
Carbon Dioxide & Chemical Co. Salt Lake City, Utah
Cardox Corp. Walden, Colo.
Cardox Western, Inc. Niland, Calif.
Commercial Solvents Corp. Agnew, Calif.
Gas-Ice Corp. Asland, Ore.
Gas-Ice Corp. Klickitat, Wash.
E. J. Gibson Ukiah, Calif.
Lac Chemicals, Inc. Culver City, Calif.
Liquid Carbonic Corp. Los Angeles, Calif.
Liquid Carbonic Corp. San Francisco, Calif.
Liquid Carbonic Corp. Denver, Colo.
Liquid Carbonic Corp. Seattle, Wash.
Pacific Western Oil Co. Price, Utah
Pure Carbonic, Inc. Berkeley, Calif.
U. S. Industrial Chemicals, Inc. Anaheim, Calif.

Hydrogen

Clorox Chemical Co. Oakland, Calif.
Colorado Fuel & Iron Co. Denver, Colo.
Dow Chemical Co. Pittsburg, Calif.
Hooker Electrochemical Co. Tacoma, Wash.
National Cylinder Gas Co. Los Angeles, Calif.
Pennsylvania Salt Mfg. Co. Portland, Ore.
Pennsylvania Salt Mfg. Co. Tacoma, Wash.
Stauffer Chemical Co. Henderson, Nev.
Stuart Oxygen Co. San Francisco, Calif.

Oxygen

Acetylene Co. of Utah Salt Lake City, Utah
Acetylene Service Co. Denver, Colo.
Air Reduction Pacific Co. Emeryville, Calif.
Air Reduction Pacific Co. Los Angeles, Calif.
Air Reduction Pacific Co. Portland, Ore.
Air Reduction Pacific Co. Seattle, Wash.
Burdett Oxygen Co. of Calif. Huntington Park, Calif.
Denver Oxygen Co. Denver, Colo.
Dye Oxygen Co. Phoenix, Ariz.
Industrial Air Products Co. Medford, Ore.
Industrial Air Products Co. Portland, Ore.
Industrial Air Products Co. Spokane, Wash.
Inland Oxygen-Acetylene Co. Spokane, Wash.
Linde Air Products Co. Phoenix, Ariz.
Linde Air Products Co. Tucson, Ariz.
Linde Air Products Co. Berkeley, Calif.
Linde Air Products Co. Los Angeles, Calif.
Linde Air Products Co. Stockton, Calif.
Linde Air Products Co. San Diego, Calif.
Linde Air Products Co. Denver, Colo.
Linde Air Products Co. Boise, Idaho
Linde Air Products Co. Billings, Mont.
Linde Air Products Co. Butte, Mont.
Linde Air Products Co. Albuquerque, N. M.
Linde Air Products Co. Portland, Ore.
Linde Air Products Co. Salt Lake City, Utah
Linde Air Products Co. Seattle, Wash.
Linde Air Products Co. Spokane, Wash.
National Cylinder Gas Co. Los Angeles, Calif.
National Cylinder Gas Co. Portland, Ore.
National Cylinder Gas Co. Seattle, Wash.
Pacific Acetylene Co. San Diego, Calif.
Pacific Oxygen Co. Oakland, Calif.
Portland Oxygen Co. Portland, Ore.
Seattle Oxygen Co. Seattle, Wash.
Stuart Oxygen Co. San Francisco, Calif.
Stuart Oxygen Co. Hanford, Calif.
Stuart Oxygen Co. Los Angeles, Calif.
Stuart Oxygen Co. Portland, Ore.
Western Oxygen Co., Inc. Seattle, Wash.
Whitmore Oxygen Co. Salt Lake City, Utah

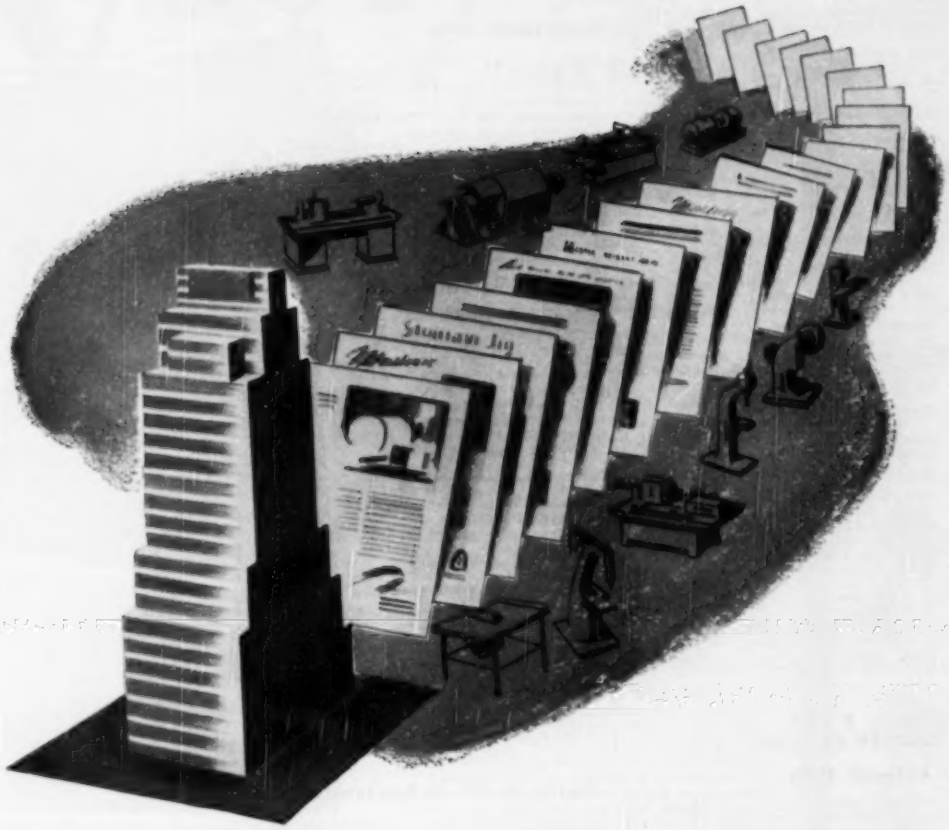
LEATHER

Beeger Tanning Co. Redwood City, Calif.
L. P. Degen Belting Co. San Francisco, Calif.
S. H. Frank & Co. Redwood City, Calif.
Herman H. Heiser Saddlery Co. Denver, Colo.
E. F. Houghton & Co. San Francisco, Calif.
Jay Dee Leather Co. Redwood City, Calif.
Legallet Tanning Co. San Francisco, Calif.
Levin Tanning Co. Santa Rosa, Calif.
Manasse-Block Tanning Co. Berkeley, Calif.
Metten & Gebhardt San Francisco, Calif.
Poetsch & Peterson S. San Francisco, Calif.
A. K. Salz Co. Santa Cruz, Calif.
Sawyer Tanning Co. Napa, Calif.
Sonoma Leather Co. Santa Rosa, Calif.

CEMENT, LIME

Cement

Arizona Portland Cement Co. Rillito, Ariz.
Calaveras Cement Co. San Andreas, Calif.
California Portland Cement Co. Colton, Calif.
Colorado Portland Cement Co. La Porte, Colo.
Colorado Portland Cement Co. Portland, Colo.
Columbia Portland Cement Co. Orofino, Idaho
Columbia Portland Cement Co. Spokane, Wash.
Elizalde & Co., Ltd. Beatty, Nev.
Fowler & Meyers Somis, Calif.
Idaho Portland Cement Co. Inkom, Idaho
Ideal Cement Co. Boettscher, Colo.
Ideal Cement Co. Portland, Colo.
Ideal Cement Co. Hanover, Mont.
Ideal Cement Co. Devils Slide, Utah
Lehigh Portland Cement Co. Metaline Falls, Wash.
Lehigh Portland Cement Co. Spokane, Wash.
Monolith Portland Cement Co. Monolith, Calif.
Monolith Portland Midwest Corp. Laramie, Wyo.
Northwestern Portland Cement Co. Grotto, Wash.
Northwestern Portland Cement Co. Seattle, Wash.
Olympic Portland Cement Co. Bellingham, Wash.
Oregon Portland Cement Co. Lime, Ore.
Oregon Portland Cement Co. Oswego, Ore.
Pacific Portland Cement Co. Redwood City, Calif.
Pacific Portland Cement Co. San Juan Bautista, Calif.
Pacific Portland Cement Co. Gerlach, Nev.
Pacific Portland Cement Co. Gold Hill, Ore.
Permanente Cement Corp. Permanente, Calif.
Portland Cement Co. of Utah Salt Lake City, Utah
Riverside Cement Co. Crestmore, Calif.
Riverside Cement Co. Oro Grande, Calif.
Riverside Cement Co. Riverside, Calif.
Santa Cruz Portland Cement Davenport, Calif.
Southwestern Portland Cement Co. Los Angeles, Calif.
Southwestern Portland Cement Co. Victorville, Calif.



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As you go through the pages of this magazine . . . or of any other McGraw-Hill publication . . . a colorful parade of advertising pages unfolds before your eyes.

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McGRAW-HILL

Publishing Company, Inc., 330 West 42nd Street, New York 18, N. Y.

HEADQUARTERS FOR INDUSTRIAL INFORMATION

Cement, cont.

Spokane Portland Cement Co. Irvin, Wash.
Spokane Portland Cement Co. Spokane, Wash.
Superior Portland Cement Co., Inc. Concrete, Wash.
Superior Portland Cement Co., Inc. Seattle, Wash.
Union Portland Cement Co. Devils Slide, Utah
Three Forks Portland Cement Co. Trident, Mont.

Lime

Blue Diamond Corp., Ltd. Los Angeles, Calif.
Blue Diamond Corp., Ltd. Blue Diamond, Nev.
Chief Consolidated Mining Co. Eureka, Utah
Diamond Springs Lime Co. Diamond Springs, Calif.
Ellistos Lime Co. Ellistos, Mont.
Golden Cycle Corp. Colorado Springs, Colo.
Grand Canyon Lime & Cement Co. Los Angeles, Calif.
Grand Canyon Lime & Cement Co. Nelson, Ariz.
Hoopes & Co. Miami, Ariz.
Horsehead Lime Co. Williams, Ore.
Industrial Raw Materials, Inc. Portland, Ore.
New Process Lime Co. Tucson, Ariz.
Orofino Lime Products Co. Orofino, Idaho
Pacific Carbide & Alloys Co. Portland, Ore.
Paul Lime Co. Paul Spur, Ariz.
Provo Lime Co. Provo, Utah
Roche Harbor Lime Co. Roche Harbor, Wash.
U. S. Gypsum Co. Evans, Wash.
U. S. Gypsum Co. Heath, Mont.
U. S. Lime Products Corp. Sloan, Nev.
U. S. Lime Products Corp. Sonora, Calif.
Utah Copper Co. Magna, Utah
Utah Lime & Stone Co. Grantsville, Utah

OILS, FATS, DERIVATIVES

Animal Oils

Buckeye Tallow Works Buckeye, Ariz.
California Packing Corp. Emeryville, Calif.
California Rendering Co. Los Angeles, Calif.
Capitol Rendering Works Denver, Colo.
Colorado Byproducts Co. Denver, Colo.
Cudahy Packing Co. Los Angeles, Calif.
Cudahy Packing Co. Phoenix, Ariz.
Denver Rendering Co. Denver, Colo.
Glendale Tallow Works Glendale, Ariz.
Greeley Rendering Plant Greeley, Colo.
W. C. Hardesty Co. Los Angeles, Calif.
La Junta Rendering Co. La Junta, Colo.
Longmont Rendering Co. Longmont, Colo.
Loveland Rendering Co. Loveland, Colo.
Maricopa Tallow Works Tempe, Ariz.
Peterson Mfg. Co. Los Angeles, Calif.
Phoenix Tallow Co. Phoenix, Ariz.
Pueblo By-Products Co. Pueblo, Colo.
Rosefield Packin Co., Ltd. Alameda, Calif.
Royal Tallow & Soap Co. San Francisco, Calif.
Sterling Rendering Works Sterling, Colo.
Swift & Co. San Francisco, Calif.
Tucson Tallow Co. Tucson, Ariz.
Union Products Corp. San Francisco, Calif.
Union Rendering Co. Denver, Colo.
Valley By-Products Co. Monte Vista, Colo.
Western Slope Hides & Rendering Co. Montrose, Colo.

Fish Oils

American Fisheries Co. San Diego, Calif.
Bio-Products Oregon, Ltd. Astoria, Ore.
F. E. Booth Co., Inc. San Francisco, Calif.
Hooker Electrochemical Co. Tacoma, Wash.
Lyle Branchflower Co. Seattle, Wash.
Red Rock Fisheries, Inc. Richmond, Calif.

Vegetable Oils

Anaheim Citrus Products Co. Anaheim, Calif.
Archer Daniels Midland Co. Portland, Ore.
Arnold Pickle & Olive Co. Phoenix, Ariz.
Baker Castor Oil Co. Los Angeles, Calif.
California Cotton Oil Corp. Los Angeles, Calif.
I. P. Collinson & Sons Chehalis, Wash.
Copra Oil & Meal Co., Ltd. Wilmington, Calif.
Dorward & Sons Co. Richmond, Calif.
Durkee Famous Foods Co. Berkeley, Calif.
Durkee Famous Foods Co. Portland, Ore.
El Dorado Oil Works Oakland, Calif.
Exchange Orange Products Co. Tempe, Ariz.
Glidden Co., Vegetable Oil Div. Buena Park, Calif.
Industrial Oil Products Corp. Los Angeles, Calif.
Kingsburg Cotton Oil Co. Kingsburg, Calif.
Malaga Oil Products Co. Lindsay, Calif.
Northwest Processing Co. Tacoma, Wash.
Oil Seed Products Co. Fresno, Calif.
Otis Gin & Warehouse Co. Carlsbad, N. M.
Pacific Nut Oil Co. Los Angeles, Calif.
Pacific Olive Oil Co. Visalia, Calif.
Pacific Vegetable Oil Corp. Richmond, Calif.
Philippine Refining Corp. Richmond, Calif.
Proctor & Gamble Co. Long Beach, Calif.
Producers Cotton Oil Co. Fresno, Calif.
Producers Ginning Co. Safford, Ariz.
San Joaquin Cotton Oil Co. Bakersfield, Calif.
Spencer Kellogg & Sons Long Beach, Calif.
Swift & Co. Los Angeles, Calif.
Tacoma Vegetable Oils, Inc. Tacoma, Wash.
Trafton Olive Products Lindsay, Calif.
Vegetable Oil Products Co. Wilmington, Calif.
Western Cotton Products Co. Phoenix, Ariz.
Western Cotton Products Co. Tucson, Ariz.
Western Solvents, Inc. Longmont, Colo.
Western Vegetable Oils Co. Oakland, Calif.

Fatty Acids & Derivatives

El Dorado Oil Works Oakland, Calif.
Griffin Chemical Co. Richmond, Calif.
W. C. Hardesty & Co. Los Angeles, Calif.
Loffingwell Co. E. Whittier, Calif.

PAINTS, VARNISHES, LACQUERS, PIGMENTS

Acme White Lead & Color Works Los Angeles, Calif.
J. A. Adams Paint Co. San Francisco, Calif.
Allied Metals Refiners Portland, Ore.
American Lignite Products Co. Buena Vista, Calif.
American Marine Paint Co. San Francisco, Calif.
Ampruf Paint Co. El Monte, Calif.
Arco Co. of California, Ltd. Los Angeles, Calif.
A & S Paints, Inc. Beverly Hills, Calif.
Associated Lead & Zinc Co. Seattle, Wash.
Atlas Paint & Varnish Co. Los Angeles, Calif.
Austin Paint Manufacturing Co. Seattle, Wash.
Barium Products, Ltd. Modesto, Calif.
I. E. Bauer Co. Los Angeles, Calif.
Beacon Paint Co. San Francisco, Calif.
Beacon Paint Co. Denver, Colo.
Beedle Paint Products Co. San Francisco, Calif.
Benett's, Inc. Salt Lake City, Utah
C. H. Benton, Inc. San Diego, Calif.
Bishop-Conklin Paint Co. Los Angeles, Calif.
Walter N. Boysen Co. Los Angeles, Calif.
Walter N. Boysen Co. Oakland, Calif.
Andrew Brown Co. Los Angeles, Calif.
C. E. Butler Co. Oakland, Calif.
Caldow Paint Co. Oakland, Calif.
California Ink Co. Berkeley, Calif.
California Ink Co. Los Angeles, Calif.
Chemical & Pigment Co. Oakland, Calif.
Coast Paint & Chemical Co. Los Angeles, Calif.
Colorado Paint Co. Denver, Colo.
Colors & Chemicals Co. Los Angeles, Calif.
Columbian Carbon Co. Eunice, N. M.
Consolidated Paint Co. Los Angeles, Calif.
Dannenbaum Paint Co. San Francisco, Calif.
Dau-Hanson Paint Co. Los Angeles, Calif.
De Boom Paint Co. San Francisco, Calif.
Deer-O Paints & Chemicals, Ltd. Phoenix, Ariz.
Doldge-Koren Paint Co. San Francisco, Calif.
F. W. Dunne Paint Co. Oakland, Calif.
E. I. du Pont de Nemours & Co., Inc. South San Francisco, Calif.
Early American Paint & Varnish Co. Belmont, Calif.
Ellis Paint Co. Long Beach, Calif.
Everard Paint Manufacturing Co. San Francisco, Calif.
Far West Paint Manufacturing Co. Seattle, Wash.
Ferrell Paint Co. San Diego, Calif.
Leon Finch, Ltd. Los Angeles, Calif.
Fisher-Thorsen & Co., Ltd. Portland, Ore.
Florman Manufacturing Co. Pueblo, Colo.
W. P. Fuller & Co. Los Angeles, Calif.
W. P. Fuller & Co. San Francisco, Calif.
W. P. Fuller & Co. Portland, Ore.
General Carbon Co. Los Angeles, Calif.
General Paint Corp. San Francisco, Calif.
General Paint Corp. Portland, Ore.
General Paint Corp. Seattle, Wash.
General Printing Ink Co. Los Angeles, Calif.
General Printing Ink Co. South San Francisco, Calif.
Gilmore & Nolan Los Angeles, Calif.
Glidden Co. of Calif. San Francisco, Calif.
G. M. Goldberg Paint Co. San Francisco, Calif.
Great Lakes Carbon Corp. Wilmington, Calif.
Gregory Fountain Ink Co. Los Angeles, Calif.
Harbor Paint Co. Long Beach, Calif.
Hollingsworth Paints, Inc. Portland, Ore.
India Paint & Lacquer Co. Los Angeles, Calif.
Interchemical Corp. Los Angeles, Calif.
Irvington Varnish & Insulator Co. Los Angeles, Calif.
Irwin Paint Co. Berkeley, Calif.
Jarvie Paint Mfg. Co. Seattle, Wash.
Charles E. Johnson & Co. Eunice, N. M.
Johnson Paint Co. Tacoma, Wash.
Morris P. Kirk & Son, Inc. Los Angeles, Calif.
Kohler McLister Paint Co. Denver, Colo.
Kunst Brothers San Francisco, Calif.
Longview Paint & Varnish Co. Longview, Wash.
Major Paint & Varnish Co. Los Angeles, Calif.
Manning Mitchell Paint Co. San Francisco, Calif.
Mathews Paint Co. Los Angeles, Calif.
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McMurtry Manufacturing Co. Denver, Colo.
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Morwear Paint Co. Oakland, Calif.
Mountain & Plan Paint Co. Denver, Colo.
Mountain States Paint Co. Boise, Idaho
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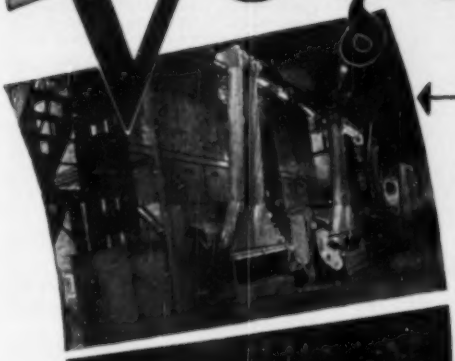

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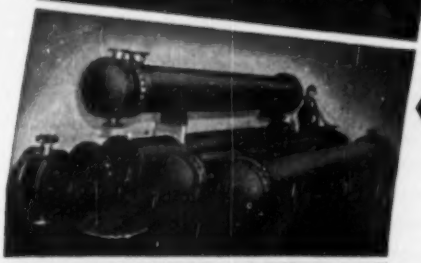

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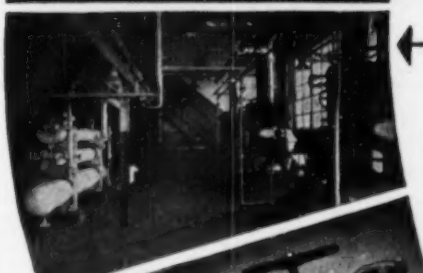

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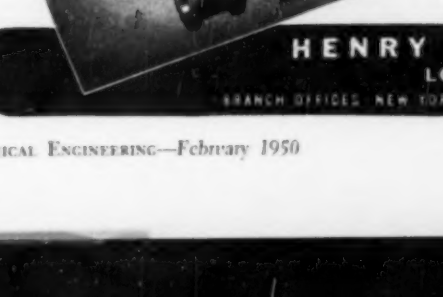

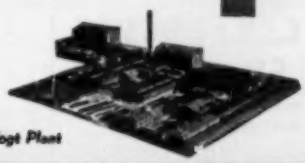

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Panhandle Carbon Co. Hobbs, N. M.
Panhandle Carbon Co. Eunice, N. M.
Paraffine Cos. Inc. Emeryville, Calif.
Parker Paint Manufacturing Co. Tacoma, Wash.
Pervo Co. Los Angeles, Calif.
Pioneer Paint & Varnish Co. Tucson, Ariz.
Pittsburgh Plate Glass Co. Los Angeles, Calif.
Pittsburgh Plate Glass Co. Portland, Ore.
Premier Oil & Lead Works Los Angeles, Calif.
Preservative Paint Co. Seattle, Wash.
Progressive Varnish Works Los Angeles, Calif.
Protective Coatings Corp. Richmond, Calif.
Quartzcote Paint & Varnish Co. Phoenix, Ariz.
Rasmusen & Co. Portland, Ore.
Reardon Co. of Calif., The Los Angeles, Calif.
D. H. Rhodes & Co. San Francisco, Calif.
Rodda Paint Co. Portland, Ore.
Rogers & Vogel Co. San Francisco, Calif.
Rudd Paint & Varnish Co. Seattle, Wash.
San Gabriel Pigment Co. Roscoe, Calif.
Schorn Paint Co. Seattle, Wash.
Scriver & Quinn, Inc. Los Angeles, Calif.
Seaside Paint & Lacquer Co. Long Beach, Calif.
Shell Chemical Co. Shell Point, Calif.
Sherwin Williams Co. Emeryville, Calif.
Sherwin Williams Co. Los Angeles, Calif.
Sillers Paint & Varnish Co. Los Angeles, Calif.
Sinclair Paint Co. Los Angeles, Calif.
Smith Davis Paint Co. Los Angeles, Calif.
Socony Vacuum Oil Co. Vernon, Calif.
Stacoat Paint & Varnish Co. Los Angeles, Calif.
Sterling Paint Co. Emeryville, Calif.
Stoner-Mudge Pacific Co. Azusa, Calif.
Synthetic Iron Color Co. Richmond, Calif.
Tibbetts Corp. Los Angeles, Calif.
Triangle Paint Co. Berkeley, Calif.
Trojan Lacquer Co. Los Angeles, Calif.
United Paint Manufacturing Co. Spokane, Wash.
Wesco Waterpaints, Inc. Berkeley, Calif.
Western Coating Co. Pasadena, Calif.
Western States Lacquer Co. Los Angeles, Calif.
C. K. Williams Co. of Calif. Emeryville, Calif.
C. K. Williams Co. of Calif. Richmond, Calif.
Yates & Smart Paint Co. San Francisco, Calif.

PESTICIDES

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Amecco Chemicals, Inc. Henderson, Nev.
American Cyanamid Co. Azusa, Calif.
Boyle Midway, Inc. Los Angeles, Calif.
California Spray Chemical Co. Richmond, Calif.
California Spray Chemical Co. Portland, Ore.
California Spray Chemical Co. Wenatchee, Wash.
Chemical Corp. of Colorado Denver, Colo.
Chemurgic Corp. Turlock, Calif.
Chipman Chemical Co. Palo Alto, Calif.
Chipman Chemical Co. Portland, Ore.
De-oxo-lin Chemical Products Co. Los Angeles, Calif.
Dow Chemical Co. Pittsburg, Calif.
E. I. du Pont de Nemours & Co., Inc. El Monte, Calif.
Eston Chemical Co. Torrance, Calif.
Eston Chemical Co. Vernon, Calif.
Fond Chemical Co. Los Angeles, Calif.
General Chemical Co. Nichols, Calif.
General Chemical Co. El Segundo, Calif.
Hammond Soap & Chemical Co. Phoenix, Ariz.
Heckathorn & Co., Ltd. Richmond, Calif.
Hochwald Chemical Co. San Francisco, Calif.
Julius Hyman & Co. Denver, Colo.
Los Angeles Chemical Co. Los Angeles, Calif.
Michel & Pelton Co. Stege, Calif.
Miller Products Co. Portland, Ore.
Moberg Laboratories Los Angeles, Calif.
Montrose Chemical Co. of Calif. Torrance, Calif.
Montrose Chemical Co. of Calif. Henderson, Nev.
Niagara Sprayer & Chemical Co. Richmond, Calif.
Pacific Guano Co. Berkeley, Calif.
Pacific Supply Cooperative Portland, Ore.
Pennsylvania Salt Mfg. Co. Portland, Ore.
Reaction Products Co. Richmond, Calif.
Research Chemical Laboratories, Inc. Burbank, Calif.
San Francisco Sulphur Co. Berkeley, Calif.
Shell Chemical Co. Domingues, Calif.
Shell Chemical Co. Martinez, Calif.
Southern California Disinfecting Co. Los Angeles, Calif.
State Products Co. Yakima, Wash.
Stauffer Chemical Co. Vernon, Calif.
Stauffer Chemical Co. Berkeley, Calif.
Stauffer Chemical Co. Torrance, Calif.
Stauffer Chemical Co. Los Vegas, Nev.
Stauffer Chemical Co. Portland, Ore.
Sunland Industries, Inc. Fresno, Calif.
Thompson Horticultural Chemicals Corp. Los Angeles, Calif.
Veith Chemical Co. Fresno, Calif.
Wheeler Reynolds & Stauffer Co. Richmond, Calif.
Yakima Valley Spray Chemical Co. Yakima, Wash.
Zehrung Chemical Co. Portland, Ore.

PETROLEUM PRODUCTS

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Aerex Co., Inc. Bloomfield, N. M.
Aromalene, Inc. Long Beach, Calif.
Bay Petroleum Corp., The Denver, Colo.
Bell-Casmite Co. Casmalia, Calif.
Ben Hur Refining Co. Long Beach, Calif.
Big West Oil Co. of Montana Kevin, Mont.
C. & H. Refinery Lusk, Wyo.
Calstate Refining Co. Long Beach, Calif.
Caminol Co., Inc. Hanford, Calif.
Caminol Co., Inc. Santa Fe Springs, Calif.
Carter Oil Co. Billings, Mont.
Carter Oil Co. Cut Bank, Mont.
Century Oil Co. Long Beach, Calif.
Continental Oil Co. Billings, Mont.
Continental Oil Co. Denver, Colo.
Continental Oil Co. Artesia, N. M.
Continental Oil Co. Farmington, N. M.
Continental Oil Co. Glenrock, Wyo.
Cooperative Refinery Assn. New Castle, Wyo.
Crook County Refinery Sundance, Wyo.
Douglas Oil Co. of Calif. Bakersfield, Calif.
Douglas Oil Co. of Calif. Clearwater, Calif.
Eagle Oil & Refining Co., Inc. Santa Fe Springs, Calif.
Economy Asphalt Co. Oxnard, Calif.
Elk Horn Gas Refinery Osage, Wyo.
Empire Petroleum Co. Denver, Colo.
Empire State Oil Co. Thermopolis, Wyo.
Envoy Petroleum Co. Long Beach, Calif.
Exeter Refining Co. Long Beach, Calif.
Farmers Union Central Exchange Laurel, Mont.
Five C Refining Co. Santa Maria, Calif.
Fletcher Oil Co. Wilmington, Calif.
Frontier Refining Co. Cheyenne, Wyo.
General Petroleum Corp. Torrance, Calif.
General Petroleum Corp. Vernon, Calif.
General Petroleum Corp. Lebec, Calif.
Golden Bear Oil Co. Bakersfield, Calif.
Gordon Refining Co. Fort Morgan, Colo.
Grace Oil & Refining Co. New Castle, Wyo.
Hancock Oil Co. of Calif. Long Beach, Calif.
Harbor Refining Co. Long Beach, Calif.
Hart Refineries Missoula, Mont.
Hole Brothers Refinery Cut Bank, Mont.
Hunt, Eugene Winnett, Mont.
Husky Refining Co. Lovell, Wyo.
Husky Refining Co. Cody, Wyo.
Independent Refinery Lusk, Wyo.
Malco Refineries, Inc. Roswell, N. M.
McCallen Refining Co., Ltd. Huntington Beach, Calif.
McMillan Petroleum Corp. Long Beach, Calif.
McNutt Oil & Refining Co., Inc. Brickland, N. M.
Maritime Petroleum Corp. Wilmington, Calif.
Mohawk Petroleum Corp. Bakersfield, Calif.

Newhall Refining Co.	Newhall, Calif.
New Mexico Asphalt & Refining Co.	Artesia, N. M.
North Star Refining Co.	Shelby, Mont.
Norwalk Co., The	Maricopa, Calif.
Ohio Oil Co., The	Lovell, Wyo.
Olympic Refining Co.	Long Beach, Calif.
Oriental Refining Co.	Alamosa, Colo.
Oriental Refining Co.	Denver, Colo.
Oxford Oil Co.	Long Beach, Calif.
Pacific States Oil Co.	Wilmington, Calif.
Palomar Refining Co.	Bakersfield, Calif.
Pathfinder Petroleum Co.	Los Alamitos, Calif.
Petrol Corp.	Los Angeles, Calif.
Petroleum Products Refining & Prod. Co.	Prewitt, N. M.
Pilot Oil Co.	Morton, Wyo.
Resolute Oil Corp.	Badger Basin, Wyo.
Richfield Oil Corp.	Vinvale, Calif.
Richfield Oil Corp.	Watson, Calif.
Rothschild Oil Co., Inc.	Santa Fe Springs, Calif.
Salt Lake Refining Co.	Salt Lake City, Utah
Seaside Oil Co.	Ventura, Calif.
Shell Oil Co.	Martinez, Calif.
Shell Oil Co.	Wilmington, Calif.
Sinclair Refining Co.	Sinclair, Wyo.
Skelly Oil Co.	Denver, Colo.
Socal Oil & Refining Co.	Huntington Beach, Calif.
Socony Vacuum Oil Co.	Casper, Wyo.
Soto Refining Co.	Los Angeles, Calif.
Standard Oil Co. of Calif.	El Segundo, Calif.
Standard Oil Co. of Calif.	Richmond, Calif.
Standard Oil Co. of Calif.	Bakersfield, Calif.
Standard Oil Co. of Indiana	Casper, Wyo.
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Sunland Refining Corp.	Bakersfield, Calif.
Sunray Oil Corp.	Santa Maria, Calif.
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The Texas Co.	Fillmore, Calif.
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Tide Water Associated Oil Co.	Avon, Calif.
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Triangle Oil & Refining Co.	Venice, Calif.
Uinta Oil Refining Co.	Jensen, Utah
Union Oil Co. of Calif.	Bakersfield, Calif.
Union Oil Co. of Calif.	Oleum, Calif.
Union Oil Co. of Calif.	Wilmington, Calif.
Union Oil Co. of Calif.	Cut Bank, Mont.
Unity Petroleum Corp.	Kalispell, Mont.
Utah Oil Refining Co.	Salt Lake City, Utah
Warren Petroleum Corp.	Monument, N. M.
Wasatch Oil Co.	Pocatello, Idaho
Wasatch Oil Co.—Ada Oil Co.	Great Falls, Mont.
Wasatch Oil Co.	Woods Cross, Utah
Wasatch Oil Co.	Spokane, Wash.
Western Asphalt & Refining Co.	Santa Maria, Calif.
Western States Refining Co.	North Salt Lake City, Utah
Wilshire Oil Co., Inc.	Norwalk, Calif.
Z & W Service & Refinery	Torrington, Wyo.

Natural Gasoline

Bankline Oil Co.	Long Beach, Calif.
Barnsdall Oil Co.	Newhall, Calif.
Brea Canon Oil Co.	Brea, Calif.
Coline Gasoline Co.	Ventura, Calif.
Continental Oil Co.	Ventura, Calif.
Continental Oil Co.	Lance Creek, Wyo.
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Del Valle Gasoline Co.	Saugus, Calif.
Doheny Oil Co.	Coalinga, Calif.
El Paso Natural Gas Co.	Jal, N. M.
El Paso Natural Gas Co.	Langley-Mattix, N. M.
Fullerton Oil Co.	Huntington Beach, Calif.
General Petroleum Corp.	Los Angeles, Calif.
General Petroleum Corp.	Burrel, Calif.
General Petroleum Corp.	Brea, Calif.
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Honolulu Oil Corp. Taft, Calif.
Inglewood Gasoline Corp. Inglewood, Calif.
Loco Hills Pressure Maintenance Assn., Inc. Loco Hills, N. M.
Lomita Gasoline Co. Long Beach, Calif.
Maljamar Cooperative Artesia, N. M.
Northern Utilities Co. Sand Draw, Wyo.
Norwalk Co., The Santa Fe Springs, Calif.
Ohio Oil Co., The Taft, Calif.
Ohio Oil Co., The Grass Creek, Wyo.
Ohio Oil Co., The Rock River, Wyo.
Ohio Oil Co., The Medicine Bow, Wyo.
Phillips Petroleum Co. Eunice, N. M.
Phillips Petroleum Co. Hobbs, N. M.
Phillips Petroleum Co. Buckeye, N. M.
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Richfield Oil Corp. Taft, Calif.
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Shell Oil Co. Brea, Calif.
Shell Oil Co. Compton, Calif.
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Shell Oil Co. Long Beach, Calif.
Shell Oil Co. Orcutt, Calif.
Shell Oil Co. Ventura, Calif.
Signal Hill Oil & Gas Co. Goleta, Calif.
Signal Hill Oil & Gas Co. Huntington Beach, Calif.
Signal Hill Oil & Gas Co. Long Beach, Calif.
Sinclair-Wyoming Oil Co. Lost Soldier, Wyo.
Sinclair-Wyoming Oil Co. Bairoil, Wyo.
Skelly Oil Co. Eunice, N. M.
Standard Oil Co. of Calif. Huntington Beach, Calif.
Standard Oil Co. of Calif. Inglewood, Calif.
Standard Oil Co. of Calif. La Habra, Calif.
Standard Oil Co. of Calif. Santa Fe Springs, Calif.
Standard Oil Co. of Calif. Seal Beach, Calif.
Standard Oil Co. of Calif. Taft, Calif.
Standard Oil Co. of Calif. Torrance, Calif.
Stanolind Oil & Gas Co. Salt Creek, Wyo.
Superior Oil Co. Bakersfield, Calif.
The Texas Co. Long Beach, Calif.
The Texas Co. Montebello, Calif.
The Texas Co. Santa Fe Springs, Calif.
The Texas Co. Santa Paula, Calif.
Tide Water Associated Oil Co. Ventura, Calif.
Union Oil Co. of Calif. Brea, Calif.
Union Oil Co. of Calif. Compton, Calif.
Union Oil Co. of Calif. Placentia, Calif.
Union Oil Co. of Calif. Playa del Rey, Calif.
Union Oil Co. of Calif. Santa Fe Springs, Calif.
Union Oil Co. of Calif. Santa Maria, Calif.
Union Oil Co. of Calif. Cut Bank, Mont.
Warren Petroleum Co. Monument, N. M.
West Coast Refining Co. Placentia, Calif.
West Rosecrans Gasoline Co. Gardena, Calif.
Western Gulf Oil Co. Bakersfield, Calif.
Western States Gasoline Plant Avenal, Calif.
Wilmington Gasoline Co. Wilmington, Calif.

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Eddington Oil Refinery Long Beach, Calif.
Inland Asphalt Co. Spokane, Wash.
Oxnard Oil & Refining Co. Oxnard, Calif.
Pacific Coast Asphalt Co. Oxnard, Calif.
Paraffine Cos., Inc. Emeryville, Calif.
Shell Oil Co. Portland, Ore.
Stancal Asphalt & Bitumuls Co. Inglewood, Calif.
Stancal Asphalt & Bitumuls Co. Oakland, Calif.
Stancal Asphalt & Bitumuls Co. Portland, Ore.
Stancal Asphalt & Bitumuls Co. Tucson, Ariz.

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Coos Bay Pulp Corp. Anacortes, Wash.
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Crown Willamette Paper Co. West Linn, Ore.
Crown Willamette Paper Co. Camas, Wash.
Everett Pulp & Paper Co. Everett, Wash.
Fibreboard Products Inc. Antioch, Calif.
Fibreboard Products Inc. Port Angeles, Wash.
Grays Harbor Pulp & Paper Co. Hoquiam, Wash.
Hawley Pulp & Paper Co. Oregon City, Ore.
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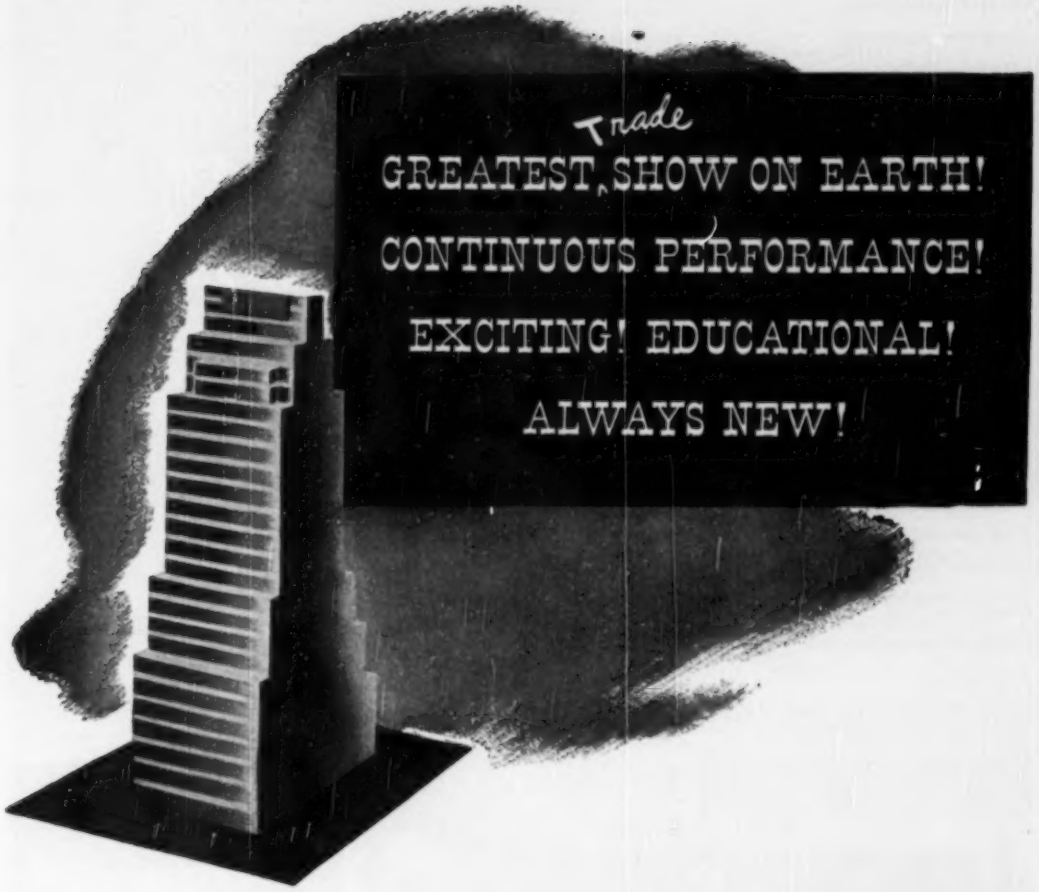

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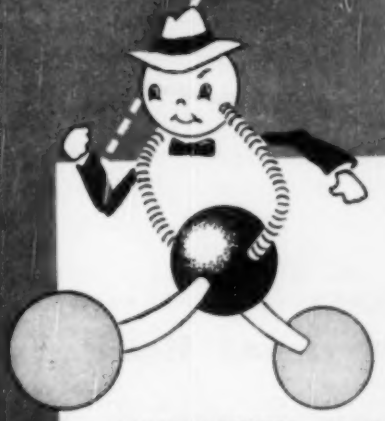

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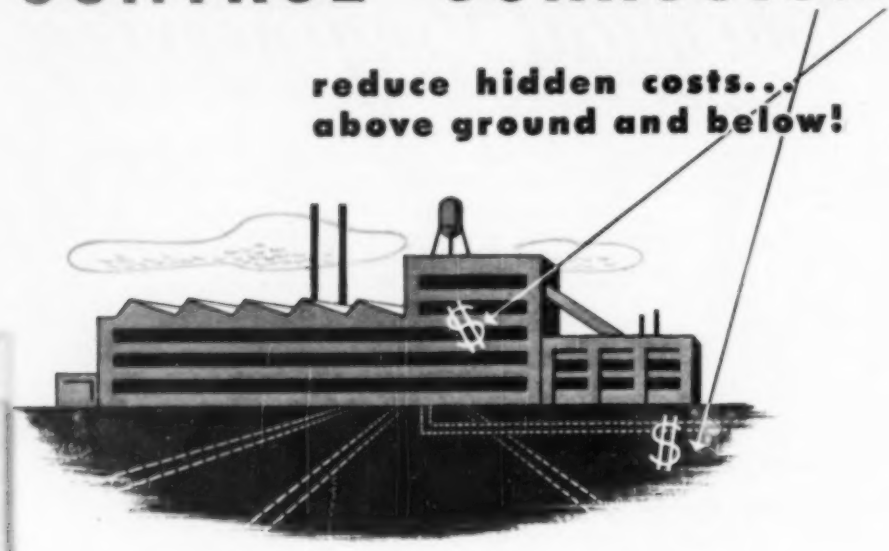

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EBASCO SERVICES

INCORPORATED

NEW YORK · CHICAGO · WASHINGTON, D.C.

Ebasco Teamwork gets things done anywhere in the world

the liquid bite...

...FATS BECOME SOAP

From soap to rayon, powerful Caustic Soda plays an important part in the preparation of a multitude of products used every day. In the conversion of cellulose into rayon — in the saponification of fatty oils into soap — in hundreds of ways Caustic Soda contributes to the country's manufacturing processes.

From Niagara Falls to Texas, fourteen great plants make Mathieson a major force in the manufacture of the five basic heavy chemicals — caustic soda, soda ash, ammonia, chlorine and sulphuric acid — and their allied products. Mathieson is a single source of supply for all five of these chemicals indispensable to industry, agriculture and public health.

Mathieson
CHEMICALS

Mathieson Chemical Corporation
MATHIESON BUILDING,
BALTIMORE 3, MARYLAND

SERVING INDUSTRY, AGRICULTURE AND PUBLIC HEALTH

INSTANT ACCEPTANCE BECAUSE OF

Instant Cartridge Interchanging!

AO Twin Cartridge RESPIRATORS

Speedy conversion from one type of respirator to another makes this "7-Respirators-in-1" equipment ideal when respiratory hazards are numerous and varied. With a single face piece and interchangeable cartridges, the new AO R5000 respirator line protects workers from the following hazards:

- Combination of all dusts (Toxic, pneumoconiosis-producing, nuisance)
- Organic vapors
- Acid gases
- Combined acid and organic gases
- Ammonia
- Organic vapors and "all dusts"
- Metal fumes as in welding, burning, smelting, refining

Dust filter and organic vapor cartridges are approved by the U. S. Bureau of Mines. R5000 shown here with AO 700 Rubber-Frame Goggle.

QUICK FACTS — New Threaded Cartridges — Wider, for lower breathing resistance. To interchange, merely unscrew one cartridge and screw in another for gas-tight seal.

New Filter Retainer Assembly — Takes either chemical cartridges or flat discs of chemically treated felt.

New Face Piece — Non-leaking, snug fitting, comfortable, of durable, natural rubber.

Superior Visual Area — New slender cartridge design and lower location of cartridge afford wider field of vision.

New Flexible Fitting Brace—Face piece adapts to features of wearer by slightest hand pressure on brace for perfect fit. Headband pressure cannot pull pliable rubber face piece out of shape.

New Inhalation and Drain Valve Designs — Provide positive action, thorough drainage and no interference by clothes or face.

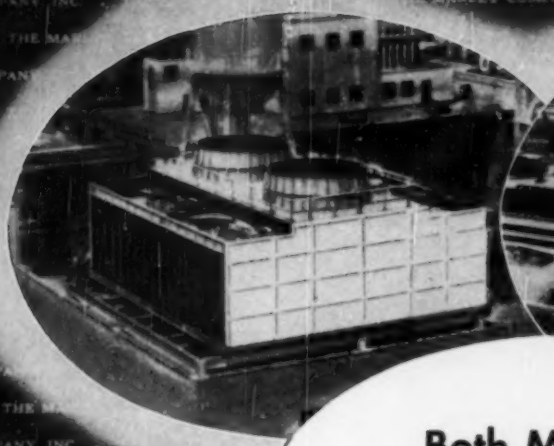
New Inventory Economy — "7-respirators-in-1" permit standardization, hence smaller inventories.

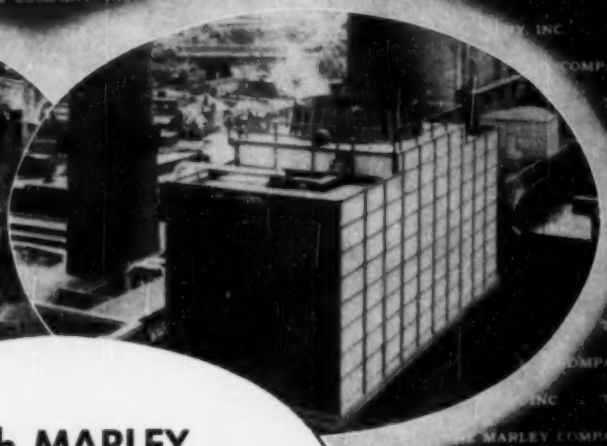
Double length headband permits "parking" of respirator around neck when not in use.

Your nearest AO Safety Products Representative can supply you

American Optical
SAFETY PRODUCTS DIVISION

Southbridge, Massachusetts • Branches in Principal Cities





Both MARLEY Double-Flows

They're Different! Why?

NO two water cooling requirements are exactly alike!

Water temperatures and gpm vary, horsepower requirements differ, space limitations are dissimilar, wet bulb conditions are not the same.

Recognizing this fact, Marley Double-Flow cooling towers are available in a wide range of sizes so you can fit a standard Double-Flow to your job . . . not the job to the cooling tower.

For example, the Marley Double-Flow on the left is used for air-conditioning service in a large department store in a climate where temperatures vary widely. Here it was desired to have a tower with four cooling cells and two fans to provide utmost flexibility . . . one, two, three or four cooling cells operating independently. A low silhouette was needed to save conflict with the city skyline. And, a broad-based tower allowed the weight to be distributed over a wide area. In order to meet a building code, the California redwood tower was cased with asbestos-board.

The Marley Double-Flow on the right was selected for one of the world's largest breweries. In this case, a tower was needed to cool a large gpm of water. Because of space limitations, the tower was erected on a high, elevated grillage with the area beneath the tower available for material storage. The cold water basin of the Double-Flow tower became the roof of the storage area.

These are only two of the hundreds of case histories in Marley files on operating Double-Flows that show how standard, low priced Double-Flow towers are expertly applied by trained application engineers.

Although sizes vary, all Marley Double-Flow cooling towers have many exclusive features . . . open distribution system, easy inspection and regulation, two independent cooling cells for each fan, nail-less filling, more drift eliminator area and Marley mechanical equipment. And, all Double-Flows are backed by the Marley guarantee.

Modern automatic machines and skilled craftsmen in three plants, enable Marley to furnish accurately fabricated towers to fit your job at a savings to you. If you have a water cooling problem, let Marley "know-how", starting in the blue-print stage, help you get MORE FOR YOUR MONEY by "custom tailoring" an economical, standard Marley Double-Flow to meet your specific needs.

MAIL THIS COUPON TODAY

The Marley Company, Inc., Kansas City 15, Kansas CE-2

☐ I'd like to know more about DOUBLE-FLOW Cooling Towers. Please send FREE Bulletin DF-50.

☐ Have Engineer call, at no obligation to us, to discuss our water cooling needs. 000

Name _____ Title _____

Company Name _____

Address _____

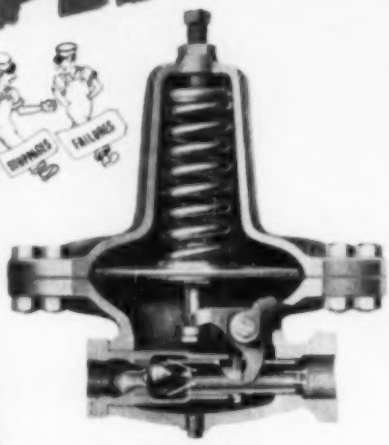
City _____ Zone _____ State _____

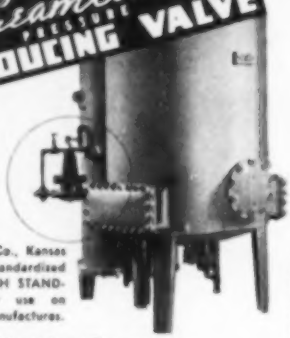
MARLEY

Double-Flow Vairflo DriCooler Natural Draft Counter-Flow Aquatower

Spray Nozzles

THESE TROUBLEMAKERS STOPPED IN THEIR TRACKS BY THE CASH STANDARD Streamlined TYPE 1000 PRESSURE REDUCING VALVE





The Butler Mfg. Co., Kansas City, Mo. has standardized for years on CASH STANDARD valves for use on vacuum stills it manufactures.

THE USERS TELL WHY IN STATEMENTS BELOW . . .

Check what they say against the 10 points we list . . . . .

An Ice Machine Co. says—
"The streamlined '1000' pressure reducing valves that we have installed on ammonia liquid lines to INSURE UNIFORM PRESSURE at the expansion valves have proven very satisfactory."

A Manufacturing Corp. says—
"We have not had an opportunity to check capacity or cost savings but are pleased with the SMOOTH OPERATION in reducing from 140 psi to 4 or 5 psi."

A Products Co. says—
"Our '1000' unit has been in use about 20 hours daily for about 2 years. In this time there has been NO FAILURES—NO INTERRUPTIONS and NO MAINTENANCE. We reduce from 100# to 20# and have practically forgotten we had the valve."

A Metallizing Co. says—
"ACCURATE PRESSURE CONTROL is vital to our operations. Your '1000' valve has given us very good service."

A Corn and Soybean Products Mfg. Co. says—
"From our experience the type '1000' reducing valve is an excellent direct operated type valve. GOOD PRESSURE CONTROL, TIGHT CLOSURE, and LOW MAINTENANCE COSTS are all factors which influenced us to use a good many of these valves in our plant."

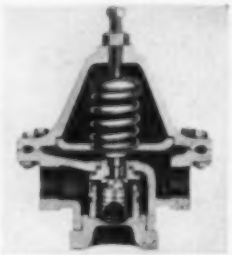
1. Maximum capacity when needed most.
2. Accurate pressure control under toughest working conditions.
3. Trouble-free service.
4. Smooth operation.
5. Tight closure.
6. Speedier production results.
7. Elimination of failures.
8. Cost-saving operation.
9. No spoilage.
10. Practically zero in maintenance.

• WRITE FOR BULLETIN 962

CASH STANDARD CONTROLS.. VALVES

A. W. CASH COMPANY
DECATUR, ILLINOIS

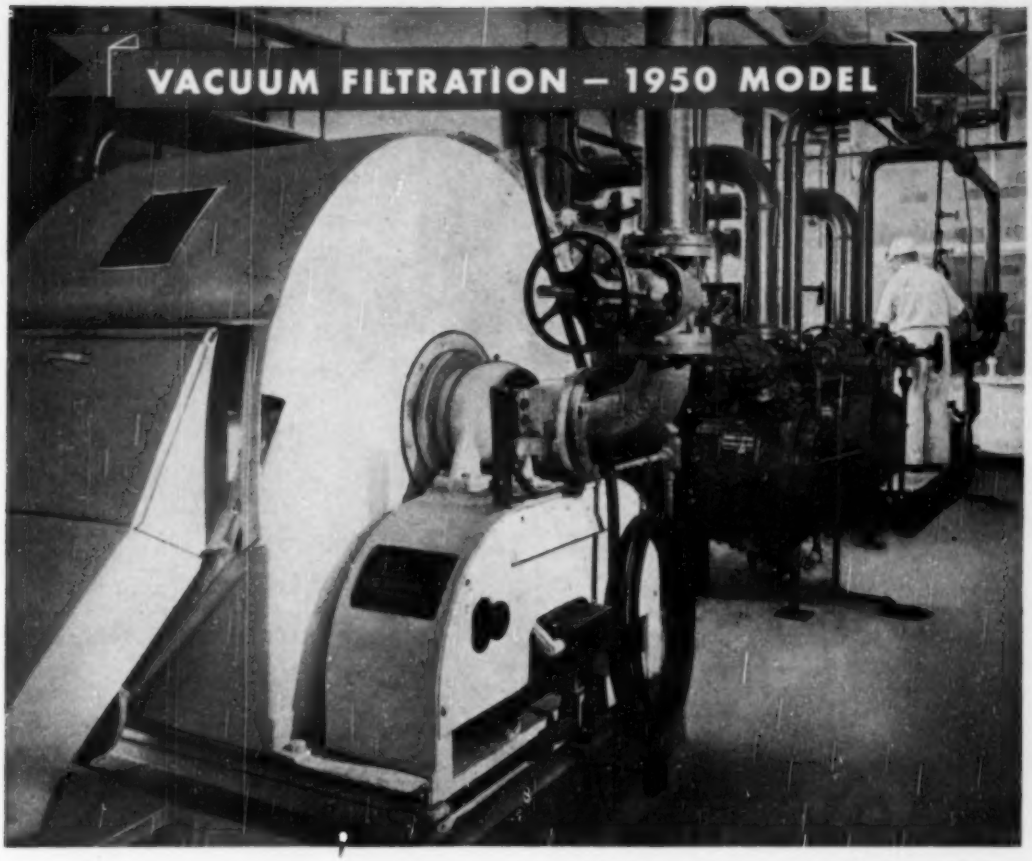
• **BULLETINS AVAILABLE ON OTHER CASH STANDARD VALVES** *Send for them* •



Bulletin 950—features the CASH STANDARD Type D Single Seat Pressure Reducing and Regulating Valves for use with most fluids. Shows simple inner working parts that save in maintenance. Diagram explains how valve works. Blueprint shows simplicity of installation.

Bulletin 956—features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.

Bulletin 966—features the CASH STANDARD Self-Contained, Pilot Operated Type 10 Pressure Reducing and Regulating Valve for use with water or air; with any gas or oil that is non-corrosive; and with refrigerating fluids such as Ammonia and Freon. Many interesting particulars explained such as: how valve works, tight seating, large capacity, no waste, no water hammer or chatter.



The BIRD-YOUNG THIN Cake
Pneumatic Discharge, Continuous, Vacuum FILTER

Before you buy vacuum filters for *any* application—slow filtering or free—look into the only filter of new and different basic design that's been put on the market in years—truly a 1950 Model — the BIRD-YOUNG FILTER.

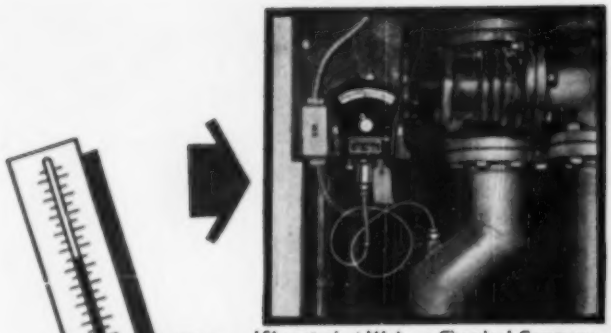
Thin cake filtration means:

Higher capacity, constantly maintained
Drier filter cakes
More thorough washing — exceedingly sharp separation of wash liquors

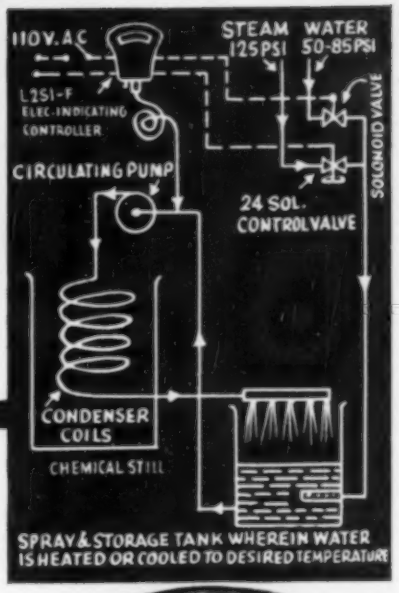
For complete information about the application and performance of the Bird-Young Filter, get in touch with

BIRD MACHINE COMPANY · South Walpole, Massachusetts

THE BIRD-YOUNG FILTER
designed, constructed and applied by the builders of the
BIRD CONTINUOUS CENTRIFUGAL FILTER



L5I control at Woburn Chemical Company



How Sarco Saves

A THOUSAND STEPS A DAY

—and prevents disaster, because this fatty acid condenser taking material at 550°, clogs up whenever the cooling water get *below* 90°. The thermometer at the condenser is several hundred feet away from the hot and cold water valves leading to the circulating tank. Seldom exactly right and often in the danger zone, changing conditions called for trips to and from the valves many times a day.

Now the Sarco L2SI Electric Control at the condenser opens and closes the valves by remote control as needed. When a batch comes through requiring 130 degree cooling water, a twist of the wrist changes the control setting.

Why not make your plant automatic with Sarco; have all temperatures where you want them, all the time? You will be surprised to see how little Sarco Controls cost compared to what they will do for you.

The Sarco Representative can look over your tanks, processes, hot water and heating systems in a few hours.

The Sarco L2SI Electric Control actuates cold and hot water valves as often as required. Setting can be changed by turning thumb screw. Temperature indicated on large dial selected to include only the range of temperatures to be controlled. Thousands in use in Chemical, Food, Plating and other process plants. Bulletins Nos. 1000 and 1025.

360

SARCO SAVES STEAM

SARCO COMPANY, INC.

Represented in Principal Cities

Empire State Building, New York 1, N. Y.

SARCO CANADA, LTD., TORONTO 5, ONTARIO

IMPROVES PRODUCT QUALITY AND OUTPUT

LINK-BELT *Screw Conveyor*
· · · Tops in Efficiency!

Bulk materials handling reduced to its simplest terms is represented by Link-Belt screw conveyor. Applicable to a wide variety of handling jobs it is the preferred method in thousands of plants in greatly diversified industries. Simple in construction, with a minimum number of moving parts, it is easy to install, economical to operate, requires negligible attention or upkeep.

Compact, it occupies less space than other types of conveyors; has no return run.

Dust-tight, it protects contents against waste or contamination.

Adaptable, it operates at any angle, and will perform mixing, blending or feeding operations with elevating, lowering or horizontal conveying. Note inset photograph showing parallel flights of opposite hands, in common trough.

Link-Belt Company originated and is the largest producer of Helicoid continuous rolled conveyor flighting. Link-Belt screw conveyor is also made in sectional form, in a wide range of diameters, gauges and pitches, and in various metals.

Link-Belt engineers invite your request for information or assistance in planning efficient low-cost screw conveyor installations. Contact our nearest office.

91.588

TYPES OF LINK-BELT CONVEYING MACHINERY

Belt Conveyors	Apron Conveyors
Screw Conveyors	Oscillating Conveyors
Bulk-Flo Conveyors	Flight Conveyors
Chain Conveyors	Bucket Elevators
Trolley Conveyors	Bucket Carriers

LINK-BELT COMPANY Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Houston 3, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities.

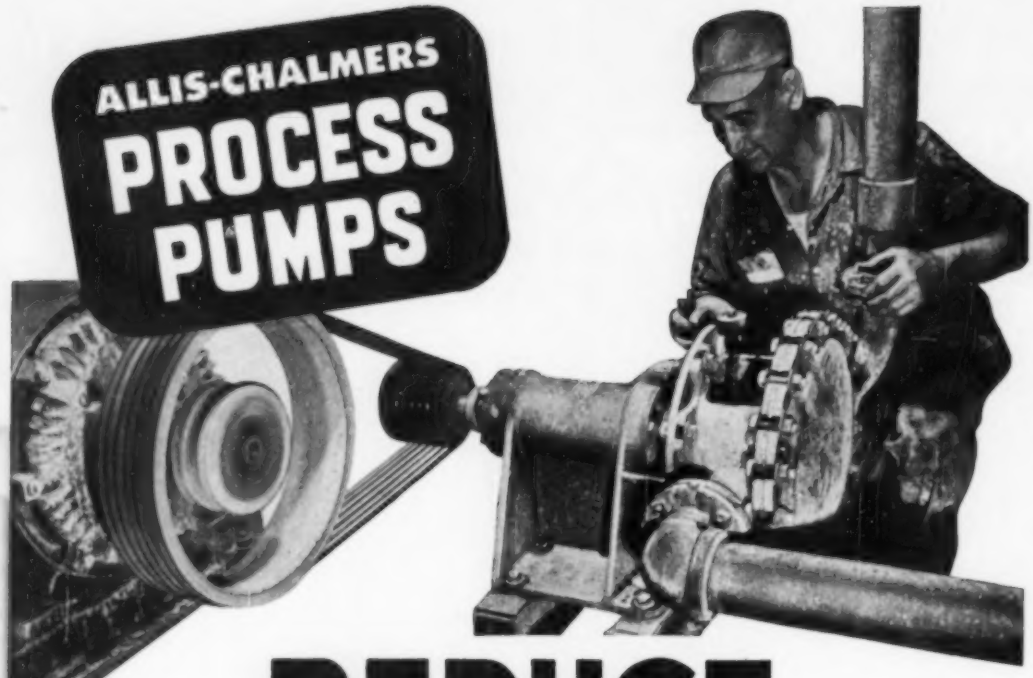
LINK-BELT

CONVEYING MACHINERY

"THE COMPLETE LINE"

ALLIS-CHALMERS

PROCESS PUMPS



REDUCE PUMP TROUBLE

ON ABRASIVE OR CORROSIVE JOBS

YOU CAN'T STOP abrasive and corrosive liquids from wearing out your pumps. But you can take the trouble out of process pump operation and make shutdowns for repair less frequent by using Allis-Chalmers process pumps. Special design plus special materials give you several times more life and lower maintenance costs than ordinary pumps at a relatively small price premium.

One plant reports $1,000.00 yearly saving; another 10 times longer wear with Allis-Chalmers process pumps.

STOCKED IN 4 MATERIALS

Shipment from stock on complete pumps and all parts in aluminum bronze, *Ni-resist*, 18% chrome steel and 316 stainless steel. You need not carry spare parts. And remember, only A-C can furnish the complete unit, pump, motor, *Texrope* V-belt drive and control.

Users in food and chemical processing plants have proved that A-C process pumps cost less per gallon pumped than ordinary pumps. An Allis-Chalmers pump application engineer will be glad to discuss your pumping problems and show you how to reduce *your* pumping costs. No obligation. Call your A-C Authorized Dealer or Sales Office. Or write for Bulletin 08B6615.

A-2944

ALLIS-CHALMERS, 1147A, SO. 70 ST.
MILWAUKEE, WIS.

Texrope is an Allis-Chalmers Trademark.

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

A-C

ALLIS-CHALMERS

VESSEL DIVISION

NEWS

76th ANNIVERSARY 1874 - 1950

A.O.Smith

CORPORATION

New York 17 • Philadelphia 3 • Pittsburgh 19 • Atlanta 3 • Chicago 4
Tulsa 3 • Dallas 1 • Houston 2 • Seattle 1 • Los Angeles 14
International Division: Milwaukee 1

FROM MIDGETS TO GIANTS range the size of pressure vessels and welded structures manufactured in A. O. Smith Vessel plants. To the left is part of an order for 2 ft. dia. x 80 ft. long storage tanks. Below are four huge lined coke drums, 16 ft. dia. by 91 ft., being manufactured simultaneously.

FORERUNNER OF THE FUTURE—Alloy-lined steel acid-storage tanks, like the one shown below, manufactured by A. O. Smith for the paper industry, are replacing existing wooden tanks, which have a limited life. A. O. Smith manufactured the first alloy-lined steel acid-storage tank ever made.

A. O. SMITH IS A LEADER in manufacturing plain carbon steel and corrosion-resistant pressure vessels. This A. O. Smith Vacuum Column, partially lined with type 405 stainless steel, combines extensive knowledge of both types of manufacture.

A. O. Smith Corporation, Dept. CE-250
Milwaukee 1, Wisconsin

Send the latest A. O. Smith Vessel Bulletins:

- ☐ V-46: Alloy, Alloy-lined, Clad, and Glass-lined Vessels
- ☐ V-44: Field Assembly of Pressure Vessels
- ☐ V-52: Multi-Layer Manufacture and Assembly

To: _____

Firm _____

Street _____ City _____ State _____

C-E Vertical-Unit Boilers

Modern steam generating equipment can't lower the price of a ton of coal or a barrel of oil, but it *can* produce *more* steam from every ton of coal or every barrel of oil. The modern unit can't lower the cost of a man-hour, but it *can* and *does* operate so reliably that maintenance costs are kept at a minimum.

C-E Vertical-Unit Boilers represent truly modern standards of design. To an exceptional degree they incorporate all the important advances in steam generation made in the past twenty-five years . . . advances that have resulted in substantially increased efficiencies and lower operating costs. At today's high costs of fuel and labor, these gains in operating efficiency may well prove the difference that will make replacement a profitable procedure for you. So whether you are considering the purchase of equipment for replacement or expansion, or for a new plant, a C-E Vertical-Unit Boiler will provide the right answer to your particular situation.

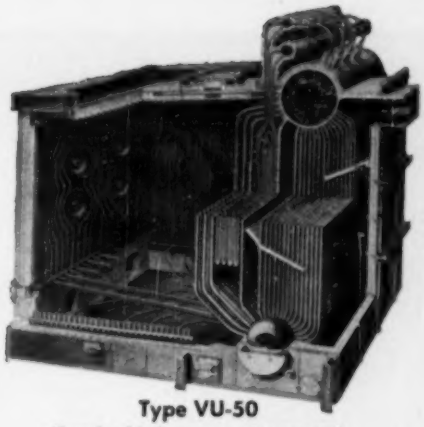
The three units illustrated—and others in the Vertical-Unit line not shown—are collectively designed to serve virtually every industrial requirement from about 10,000 to 300,000 (or more) lb of steam per hour, pressure up to 1,000 psi and steam temperatures to 900 F. The entire Vertical-Unit line offers the advantages of time-tested standards of design coupled with that flexibility of application—fuels, firing methods, operating conditions, etc.—required to meet particular plant needs. We shall be pleased to supply catalogs and any additional information required upon request. 8-371

COMBUSTION ENGINEERING

A MERGER OF COMBUSTION ENGINEERING COMPANY, INC. AND THE SUPERHEATER COMPANY

-Unit

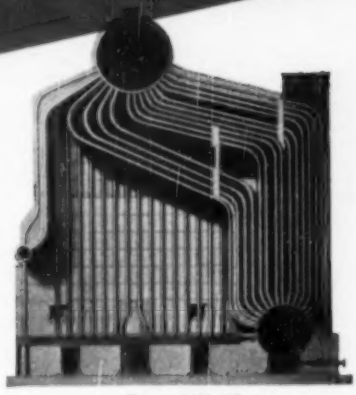
today's best answer to high steam costs



Type VU-50

(for the higher capacity range)

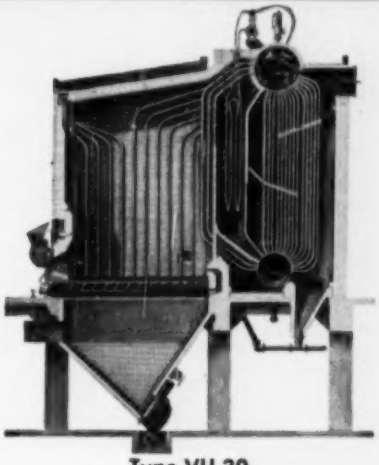
This unit, the original VU design, may be fired by pulverized coal, oil or gas, or any combination of these fuels. Available for capacities up to 300,000, or more, lb of steam per hr, pressures up to 1000 psi and steam temperatures up to 900 F, or higher. Furnace bottom may be as shown or may be of hopper type. Economizer or air heater surface may be added.



Type VU-10

(for the lower capacity range)

This member of the VU family is designed for industrial load conditions and particularly for plants having small operating and maintenance forces. Capacities range from about 10,000 to 50,000 lb per hr. Firing may be by spreader, underfeed or chain grate stokers, or by oil or gas burners. Any of these methods may be substituted for any other, should fuel market conditions make this desirable.



Type VU-30

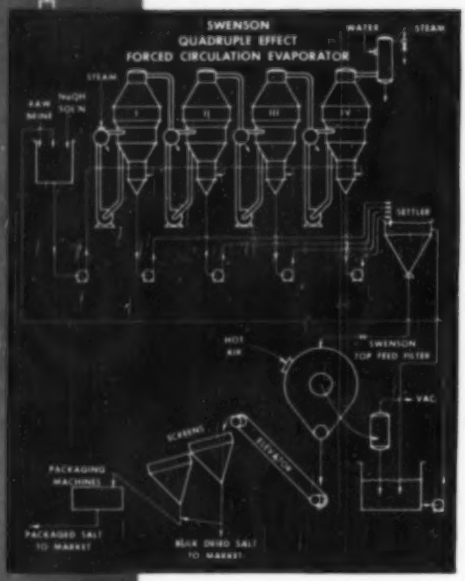
(for the middle capacity range)

In this VU design, shown equipped with a C-E Spreader Stoker, the furnace proportions and arrangement of water wall surfaces may be adapted for firing by any type of mechanical stoker. Design is also adaptable for firing by oil or gas. Economizer or air heater surface may be added. Approximate capacity range 25,000 to 100,000, or more, lb per hr.

— SUPERHEATER, INC.

200 MADISON AVENUE, NEW YORK 16, N. Y.

Improved Swenson Equipment for Refining SALT



Swenson Process Engineering has developed equipment for salt refining which affords substantial operating economies.

R. L. P. FILTERS

Swenson Rotating-Leaf Pressure Filters furnish a continuous flow of clarified brine to the evaporators.

SWENSON EVAPORATORS

Swenson Multiple-Effect Salt Evaporators are constructed of corrosion-resistant materials. Calandria, Basket, and Forced Circulation Evaporators are recommended under varying circumstances. All are built with design efficiency which minimizes steam consumption and provides for long operating cycles between boil-outs.

TOP FEED FILTERS

This equipment separates salt crystals from the brine slurry and dries them in a single operation. The dried salt contains moisture of 0.1% or less.

Swenson will gladly work with you in solving your process problems.

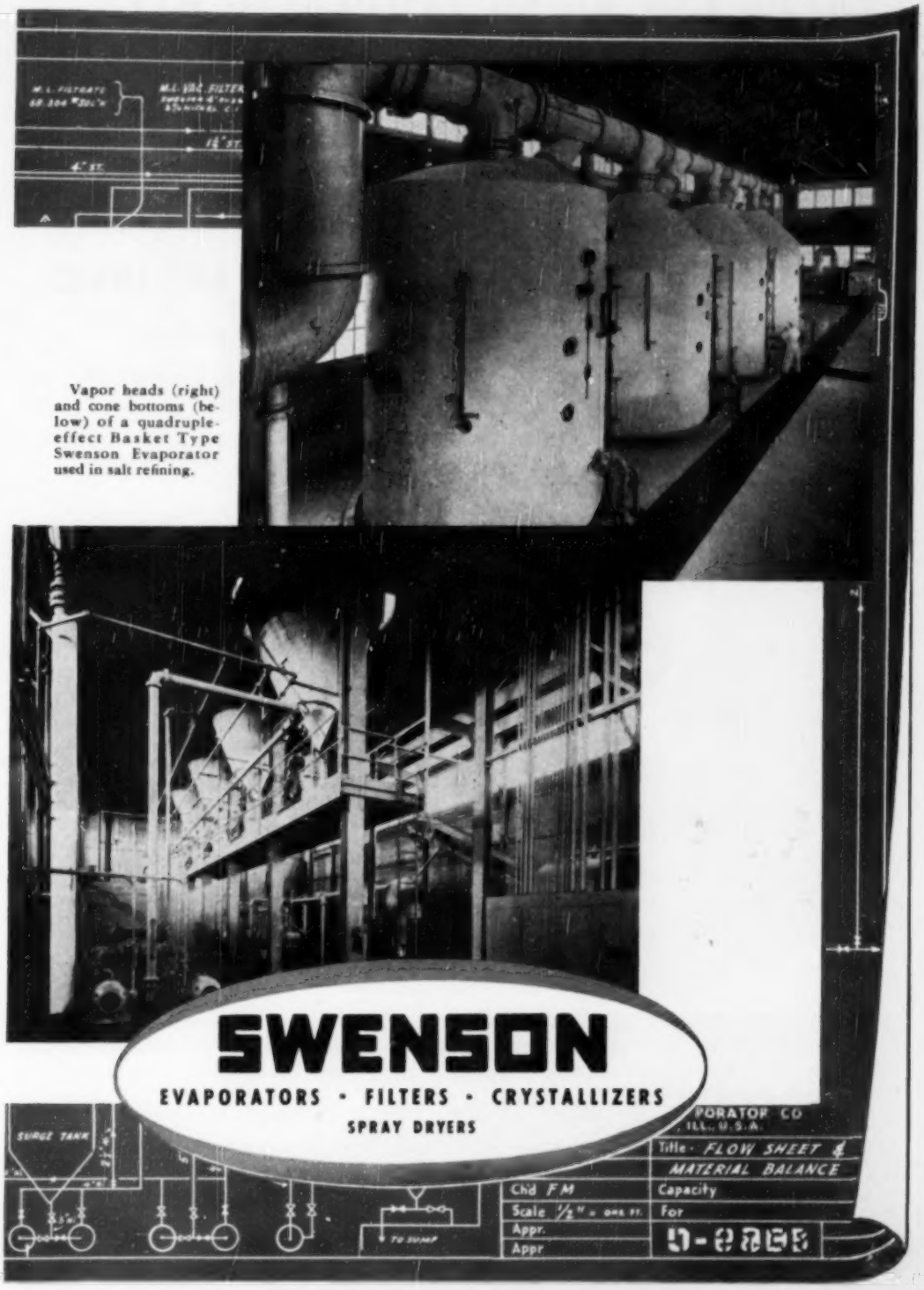
SWENSON EVAPORATOR COMPANY

Division of Whiting Corporation

15669 Lathrop Avenue — Harvey, Illinois

Export Department: 30 Church St., New York 7, N. Y.

In Canada: Whiting Corporation (Canada) Ltd., 45 Richmond St. West, Toronto



Vapor heads (right) and cone bottoms (below) of a quadruple-effect Basket Type Swenson Evaporator used in salt refining.

THERE CAN BE NO TAMPERING WITH

WOLF'S HEAD

"finest of the fine"

MOTOR OIL AND LUBES

—kept secure by Tri-Sure Closures

"Wolf's Head Oil and Lubes are accepted throughout the world as the 'finest of the fine.' When put in drums, they are sealed at the factory with the world's finest closure—Tri-Sure.* To protect Wolf's Head from any tampering, substitution and pilferage, Tri-Sure Closures provide the most reliable safeguard ever developed." **

Tri-Sure

CLOSURES

*The "Tri-Sure" Trademark is a mark of reliability backed by 27 years serving industry. It tells your customers that genuine Tri-Sure flanges (inserted with genuine Tri-Sure disc), plugs and seals have been used.

**From a letter written by the Wolf's Head Oil Refining Co., Oil City, Pa. This statement exemplifies the experience of America's leading drum users—and why they specify "Tri-Sure Closures" when they order drums.

AMERICAN FLANGE & MANUFACTURING CO. INC., 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

TRI-SURE PRODUCTS LIMITED, ST. CATHARINES, ONTARIO, CANADA

Piccolyte

the Versatile Resin

Drives your costs down . . .

Keeps your quality up!

Can you use these Piccolyte Properties ?

LIGHT LEMON COLOR
HYDROCARBON STRUCTURE
NO ACIDITY
NO SAPONIFIABLE MATTER
CHEMICAL RESISTANCE
SOLUBILITY IN ALIPHATIC NAPHTHAS
THERMOPLASTIC
COLOR STABILITY

Low-cost, high-quality PICCOLYTE provides many useful properties that enable you to reduce costs without sacrificing any of your product's values. Not only is Piccolyte low in cost, but it is readily soluble in low-cost solvents. Easy to use, because it is compatible with waxes, oils, other resins and other ingredients.

Send for a free sample, specifying intended use.

PENNSYLVANIA
INDUSTRIAL CHEMICAL CORP.
CLAIRTON, PENNA.

Makers of Coumarone Resins • Coal Tar Solvents • Styrene Resins • Rubber Plasticizers • Perfuming Oils • Terpene Resins • High Solvency Naphthas • Solvent Oils

Plants at Clairton, Pa. and Chester, Pa.

Distributed by
Pennsylvania Tolk Chemical Co., Pittsburgh 30, Pa.
and
Herwick Standard Chemical Co., Akron 3, Ohio

As the result of four years of intensive research, specially developed production processes and hundreds of laboratory and field tests, Wyandotte Chemicals Corporation is ready to supply you with increased quantities of

WYANDOTTE CARBOSE*

Reg. U. S. Pat. Off.

FOR PROMOTING DETERGENTS

*Specialized grades of **SODIUM CMC**

Wyandotte Carbose has proved its great value in increasing the effectiveness of both "built" and "unbuilt" detergent products. When incorporated in synthetic detergent formulations, small amounts of this unique compound promote detergency to a degree heretofore unattainable.

Thousands of tests on cotton fabrics show that Carbose increases soil removal and whiteness retention . . . helps prevent soil redeposition.

Detergents containing Carbose are already being used in several hundred commercial laundries. Excellent results have been obtained not only with cotton but with all classes of fabrics and with soils running from the lightest to the heaviest.

Carbose offers important advantages in a wide variety of other applications — such as water-base paints, textiles, paper and adhesives.

Wyandotte Carbose is economically priced and is available in carload quantities. If you would like to investigate what it can do for your product, simply ask your Wyandotte Service Representative for samples and complete information.

Wyandotte Chemicals Corporation
Wyandotte, Mich. • *Offices in Principal Cities*

SODA ASH • CAUSTIC SODA
BICARBONATE OF SODA
CALCIUM CARBONATE • CALCIUM CHLORIDE
CHLORINE • HYDROGEN • DRY ICE
SYNTHETIC DETERGENTS • GLYCOLS
ETHYLENE DICHLORIDE
PROPYLENE DICHLORIDE • CHLORETHERS
AROMATIC SULFONIC ACID DERIVATIVES
OTHER ORGANIC AND INORGANIC CHEMICALS

Wyandotte
REG. U. S. PAT. OFF.

Life expectancy dictates JENKINS VALVES

for the new John Hancock Building

Architects: CRAM & FERGUSON, Boston, Mass.

Builders: TURNER CONSTRUCTION CO., Boston, Mass.

Contractors for Heating, Ventilating, and Air Conditioning BUERKEL & CO., INC., Boston, Mass.

FROM TELEVISION MAST to sidewalk snow-melting system, the new John Hancock Mutual Life Insurance Company Building has been skillfully planned for operating efficiency and economy, now, and in the years to come.

All equipment was chosen with an eye to the future—*future maintenance and operating costs.* It was on this basis that Jenkins Valves were selected.

Leading architects, engineers, and contractors have specified Jenkins Valves for the nation's most efficiently planned and operated buildings and plants for over 85 years. First, because they know that Jenkins builds extra endurance into valves—proved by long life and low upkeep cost records in every type of service. Second, because they know the value of the unequalled experience Jenkins Engineers can apply to any question of selection, installation, or maintenance.

Take the long view on valve economy . . . for new installations, for replacements, rely on Jenkins Valves for lowest costs in the long run. *Sold through leading Industrial Distributors everywhere.*

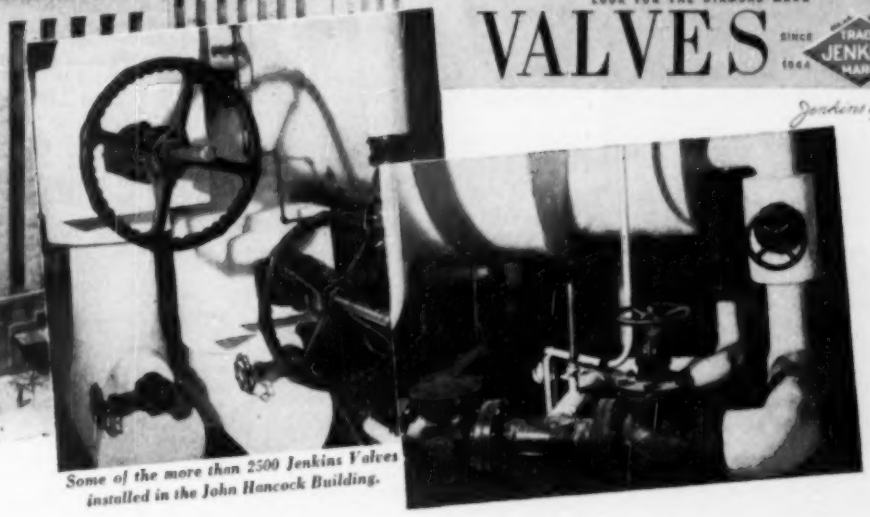
Jenkins Bros., 80 White St., New York 13; Bridgeport, Conn.; Atlanta; Boston; Philadelphia; Chicago; San Francisco. Jenkins Bros., Ltd., Montreal.

JENKINS

LOOK FOR THE DIAMOND MARK

VALVES SINCE 1864 TRADE JENKINS MARK

Jenkins Bros.



Some of the more than 2500 Jenkins Valves installed in the John Hancock Building.

For Your Information

MONSANTO PLASTICS

Every month Monsanto publishes these pages of pertinent information, selected to help you improve your products, lower your production costs, increase your sales. . . . Reprints will be sent regularly to you or other members of your organization on request.

MONSANTO'S COMPLETE LINE OFFERS PLASTICIZERS TO MEET YOUR NEEDS

There's a Monsanto Plasticizer that can deliver *any quality* you want in your product . . . if that quality can be derived from a plasticizer. This is true because Monsanto offers you the most complete line of primary and secondary plasticizers available anywhere.

Monsanto Plasticizers are so varied that there is not a resin in commercial production that cannot be plasticized by one or more Monsanto Products. There are Monsanto Plasticizers that deliver essential qualities to the best of vinyl films. Others are so low in price that they can be used to gain a favorable competitive position in buyer's markets.

If you manufacture plastic free films, molding compounds, surface coatings, adhesives, synthetic rubber, wood bonding agents or textile and paper coatings, it will be worth your while to read Monsanto's booklet of quick reference material. It's free. Ask for the booklet: "Monsanto Plasticizers," when you mail the coupon.

MONSANTO PLASTICIZERS

Dibutyl Phthalate	Triphenyl Phosphate
Diethyl Phthalate	Santicizer 140
Dimethyl Phthalate	Santicizer 141
Diphenyl Phthalate	Aroclor*
Santicizer* 107 (DOP)	HB-40
Santicizer 160	Santicizer 3
Santicizer E-15	Santicizer 8
Santicizer B-16	Santicizer 9
Santicizer M-17	Santicizer 1-H
Tricresyl Phosphate	Ortho-Nitrobiphenyl (ONB)

If Weeds Worry You, Read These Booklets

The weed problem is a business expense for many industries. If your business is one with weed worries, we will be glad to send you copies of the booklets. They are *free*.

"*Controlling Weeds With Chemical Sprays*" is a general presentation of the chemical solution to the weed problem. This book will give you valuable information about chemicals for pre-emergence and post-emergence weed control, selective and non-selective chemical sprays and a wealth of other data about herbicide compounds.

"*Chemical Weed Control On Rights of Way*" tells how to get rid of weeds along telephone and electric lines and along railway and pipe-line rights of way.

Many industries are using Monsanto Herbicidal Chemicals in their weed-control operations. These chemicals are:

- 2,4-D ACID
- 2,4-D SODIUM SALT
- 2,4-D ISOPROPYL ESTER
- 2,4,5-T ACID
- 2,4,5-T ISOPROPYL ESTER
- SANTOBRITE* (Sodium Pentachlorophenate, Tech.)
- SANTOPHEN* 20 (Pentachlorophenol, Tech.)
- ISOPROPYL N-PHENYL CARBAMATE
- SODIUM TRICHLOROACETATE

PENTA

"*PENTA to preserve wood on the farm*" is interesting reading for anyone who works with agriculture as a farmer or as a producer of farm supplies. PENTA-chlorophenol is gaining in usage as a wood preservative on the farm and in industry. If you want a copy of this booklet, mail the coupon.

Research Chemists' Corner

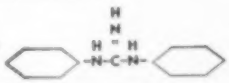
You may find something new here

Diphenylguanidine, described here, is a Monsanto Chemical which may have a great future . . . perhaps a future that is important to your business. Look at its properties. See if they do not hold possibilities for you in the development of new products or the improvement of your present line. If you want to experiment with diphenylguanidine, you can get a sample by mailing the coupon, contacting the nearest Monsanto Sales Office or writing to Monsanto headquarters, St. Louis 4, Mo.

Reactions: A strong organic base which forms salts with many organic and inorganic acids. Condenses with formaldehyde to form resins.

DIPHENYLGUANIDINE

Structure:



Appearance:	White powder
Specific Gravity:	1.19 @ 25° C.
Assay:	99% minimum by acidimetric titration
Moisture:	0.5% maximum
Ash:	0.3% maximum
Solubility:	Soluble in alcohol, benzene, chloroform, and ether. Very slightly soluble in water.

It's safer and easier to handle nitric acid in stainless steel container

Carboys . . . those big glass bottles that stick their necks out of wooden boxes . . . have carried corrosive chemicals as long as there has been a chemical industry. Now, there's a successor to the big bottle in transporting nitric acid. It's Monsanto's stainless steel container.

The new container is 50 pounds lighter in weight, hence easier to handle . . . easier to store. There's a saving on freight, too. It holds 15 gallons . . . two more than a carboy. It's safer because the danger of breakage is eliminated.

Sterox CD gives you controlled sudsing and high detergency

For applications requiring an efficient detergent making very little suds, Monsanto's Sterox* CD is a wise choice. Sterox CD is a 100%-active, nonionic-type surface-active agent, emulsifier and detergent. It is a pale yellow liquid, with medium viscosity at room temperature. Its mild, somewhat sweet, fatty odor is not objectionable, but Sterox CD can be perfumed easily where fragrance is important.

Sterox CD is a versatile product, its applications ranging from cosmetic preparations to metal cleaners. It is an efficient detergent in hard or soft water and over a wide range of temperatures. The most generally used applications include compounds for laundry operations, scouring in textile processes and general industrial cleaning.

Complete details on Sterox CD are published in Monsanto Technical Bulletin No. P-129, recently off the press. For your copy of this useful publication, mail the coupon or contact the nearest Monsanto Sales Office.

Slime and algae, enemies of good operation of cooling towers such as the one illustrated above, can be kept under control by the use of Santobrite* (Monsanto's sodium pentachlorophenate, technical). Santobrite is easy to use . . . economical . . . efficient. If you foresee a slime and algae problem next summer, send for a copy of Monsanto Technical Bulletin No. O-15. It's easier to prevent than to overcome such a problem.

Cutting oils plus Monsanto chemical step up efficiency

Santolube* 52, newest member of the Monsanto Petroleum Additive family, steps up the efficiency of cutting oils in tapping and thread-cutting operations.

Santolube 52 is free of phosphorus, sulfur and chlorine, therefore its use does not appreciably alter the ratio of these elements in a cutting oil formulation. It is available now . . . at economical prices.

MONSANTO CHEMICAL COMPANY, 1702-B South Second Street, St. Louis 4, Missouri. District Sales Offices: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto (Canada) Ltd., Montreal.

*Reg. U. S. Pat. Off.

SANTOMERSE No. 1 CLEANS IN TEMPERATURES BELOW ZERO

Frozen food locker owners are making good use of Monsanto's Santomerse* No. 1 in cleaning compartments and other parts of their plants which must be kept at low temperature. Santomerse No. 1 is successful in removing fruit stains, blood and fatty particles even when the mercury in the thermometer has to look up to see the zero. Locker managers use a solution of 2½ pounds of salt and 2 ounces of Santomerse to a gallon of water. It cleans well at −4° F.

Its ability to function at low temperature indicates that Santomerse No. 1 can be of service in any industry where there are cold processes. It also can serve in many other industries in which cold test rooms are necessary.

AN ALL-PURPOSE DETERGENT

Santomerse No. 1, an all-purpose detergent and wetting agent, is used widely in industrial cleaning. It cuts grease and dirt, lifting up particles of soil and holding them in suspension to be carried away in the rinse.

Santomerse No. 1 is widely used in the textile industry and in other enterprises in which there is need for an efficient wetter, penetrant, disperser, emulsifier or cleaner.

Here are quick facts about Monsanto's Santomerse No. 1:

Santomerse No. 1 is an excellent detergent . . . a rapid and thorough wetter. It reduces surface and interfacial tensions . . . has high stability to acids and alkalies . . . provides fast penetration . . . has high resistance to metallic ions . . . makes abundant suds . . . rinses rapidly and thoroughly.

If your business requires a detergent and wetting agent, look into efficient, economical Santomerse No. 1. Data and quotations will be sent upon request. Use the convenient coupon for prompt reply.

MONSANTO
CHEMICALS—PLASTICS

SERVING INDUSTRY...WHICH SERVES MANKIND

Sterox CD: ☐ Sample, ☐ data, ☐ quotations.
Diphenylguanidine: ☐ Sample, ☐ data, ☐ quotations.
Santomerse No. 1: ☐ Sample, ☐ data, ☐ quotations.
Santolube 52: ☐ Sample, ☐ data, ☐ quotations.
Santobrite: ☐ Sample, ☐ data, ☐ quotations.
Booklet: "Monsanto Plasticizers" ☐
Booklet: "Controlling Weeds with Chemical Sprays" ☐
Booklet: "Chemical Weed Control on Rights of Way" ☐
Booklet: "Pests to Preserve Wood on the Farm" ☐

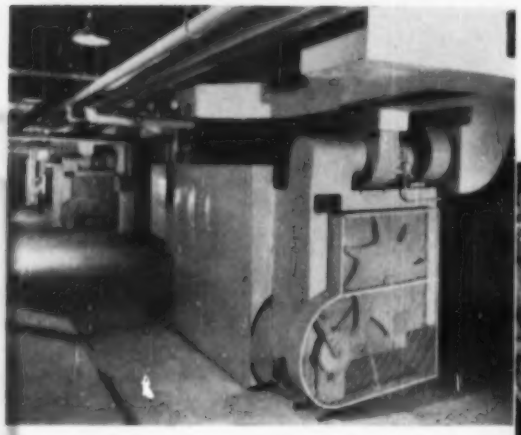
MONSANTO CHEMICAL COMPANY
1702-B South Second Street
St. Louis 4, Missouri

Without cost or obligation, please send information indicated at the left.

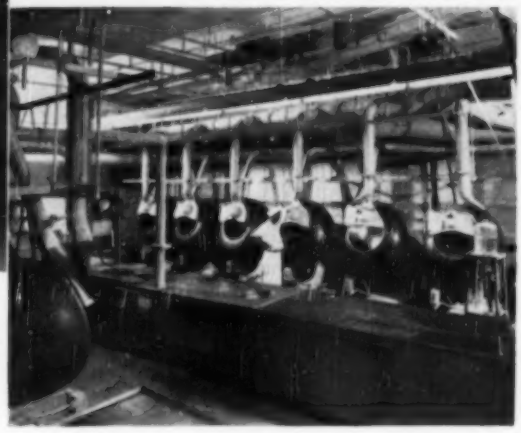
Name _____ Title _____
Company _____
Street _____
City _____ Zone _____ State _____

Chemical Manufacturing Building

SEARLE CELEBRATES 60th BIRTHDAY AND BECOMES INDEPENDENT OF "CHICAGO WEATHER"



These 3 air-drying Lectrodryers, located above the areas served, make operations independent of outside weather conditions.



Coating Room: Held at a constant low humidity by a 6,000 cfm. Lectrodryer.

Established in 1888 to produce pharmaceuticals of highest purity and accuracy, G. D. Searle & Company often had to make concessions to Chicago weather to maintain those standards. Production was slowed down and even halted on humid days until conditions were again favorable.

1949 saw them established in their ultramodern plant and independent of outside weather. The Granulating, Compressing and Coating Departments are held at constant low humidities by the three Lectrodryers shown above.

Whether your problem is too much moisture in the air, in gases or organic liquids, there's a Lectrodryer to solve it. Our engineers will advise on the equipment you need and help plan the installation. Bulletin 216 shows how other companies are doing such DRYing. For a copy and for engineering help, write Pittsburgh Lectrodryer Corporation, 303 32nd Street, Pittsburgh 30, Pennsylvania.

In England: Birlec, Limited, Tyburn Road, Erdington, Birmingham.
In Australia: Birlec, Limited, 51 Parramatta Road, Glebe, Sidney.

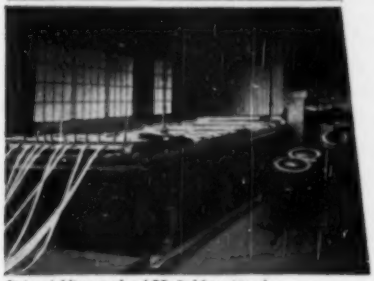
LECTRODRYERS DRY WITH ACTIVATED ALUMINAS

LECTRODRYER

REGISTERED TRADEMARK U. S. PAT. OFF.

ACE HARD RUBBER AND PLASTICS

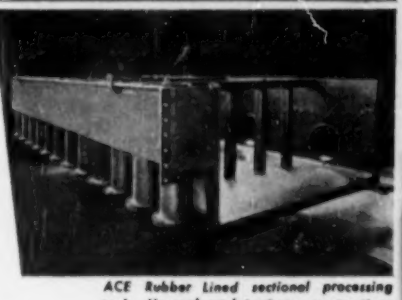
STOP CORROSION AT ALL VITAL SPOTS



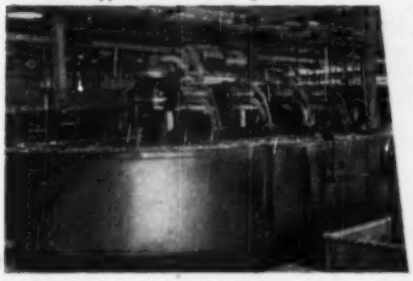
Strip pickling tank, ACE Rubber Lined. Similar tanks several hundred feet long have been supplied with ACE linings.

FOR INSTANCE ACE HARD RUBBER LINED TANKS

Ace hard rubber resists all alkalies, metallic salts of inorganic acids, hydrochloric acid any strength, nitric acid up to 16° Baume, phosphoric acid to 75%, sulphuric acid up to 50° Baume, most other inorganic acids any strength, and countless other corrosive solutio..s and fumes. Other Ace plastics such as Saran and Parian (polyethylene) extend this range of applications still further. Catalog 300-7 and Ace plastics bulletins tell you where Ace-clad and Ace molded equipment saves for you—send for them today.

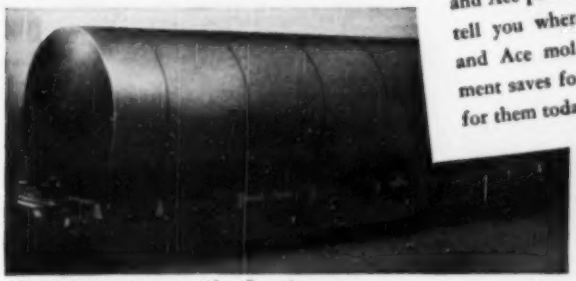


ACE Rubber Lined sectional processing tank. Unusual and intricate constructions can be lined or covered by ACE Process.



ACE Rubber Lined tank in automatic plating equipment. No current loss; permanent installation.

For heavy chemicals: ACE Rubber Lined processing tank with over-flow trough.



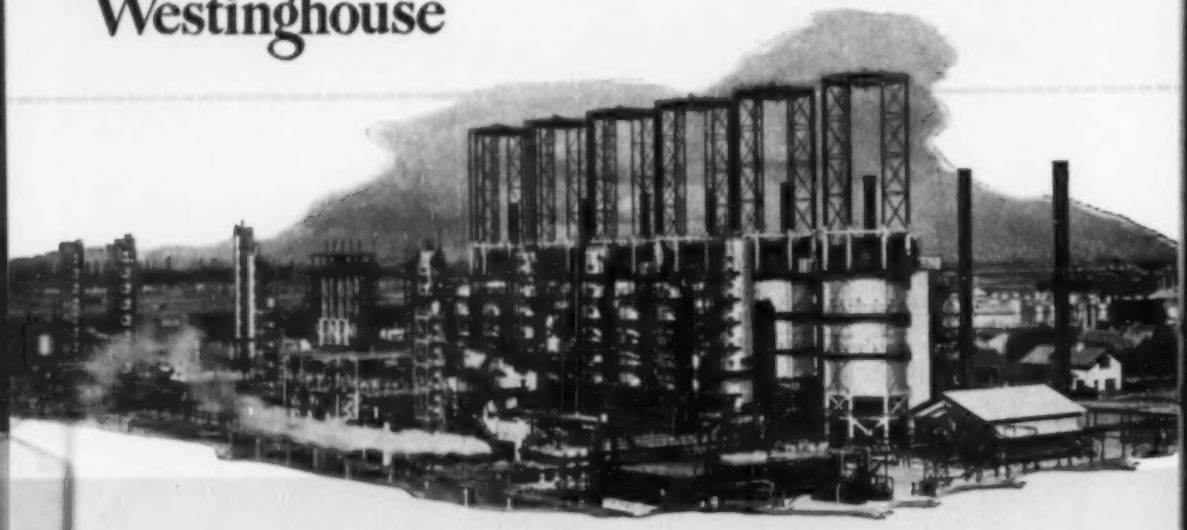
ACE Soft Rubber Lined tank 11' x 6" x 40' for storage of good grade (water white) phosphoric acid.

ACE Rubber Lined storage tank for the Paper Industry. Sectional construction for convenience in installing in an existing plant.

649-N

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



Turbines

Turbo Generators

Ignitron Rectifiers

A. C. Motors

Gear Motors

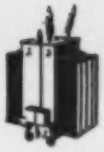
Speed Reducers

Corrosion Resisting Motor Control

Circuit Breakers for Hazardous Locations

Disconnecting Switches

Instruments



Power Transformers

Distribution Transformers and Switchgear

Capacitors

Industrial Lighting

Electronic Tubes

Oil Immersed Pushbuttons

Oil Immersed Panelboards

Westinghouse

Unit Responsibility

CUTS CHEMICAL POWER COSTS

The manufacturer of your steam and electrical equipment plays a vital role in providing the most efficient power system for your chemical processes. In serving you, that manufacturer should be capable of:

1. Providing the complete line of power equipment your process may require.

2. Furnishing you co-ordinated engineering and supervision of installation.

3. Giving you the benefit of years of experience in the application of power equipment in the Chemical Industry.

These elements of unit responsibility add up to a reduction in costs. You get them all from Westinghouse.

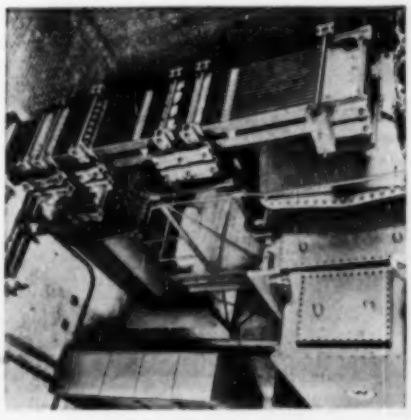
Generation: Westinghouse gives you the complete installation for producing power, plus help in working out your electrical and steam requirements for the most efficient possible plant balance.

Distribution: Westinghouse makes a correlated line of distribution apparatus, ranging from the smallest arrester to the world's largest substation. All indoor and outdoor enclosures are Bonderized to resist corrosion, and outdoor switchgear is additionally protected by all-weather undersurface coating.

Utilization: Westinghouse makes a full line of mechanical drive turbines and chemical motors, ranging from small, explosion-proof, fan-cooled, Life-Line motors to the largest explosion-resisting, inert-gas-filled, squirrel-cage type motors ever built. A complete line of Westinghouse control, including corrosion-proof or explosion-proof types where needed, is also available to meet the rigid requirements of chemical plant service.

Give us an opportunity to assume this unit responsibility and help you find the solution to your chemical power problems. Call your nearest Westinghouse office, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-94804

(Below) Westinghouse Ignitron Rectifiers provide large blocks of rectified power. They carry heavy loads continuously, at full capacity, with safety and at low maintenance cost. ***(Right)*** Without this 40,000-ampere-series resonance furnace circuit, developed by Westinghouse, the power factor would have been 30%. In this chemical plant installation, use of the series transformer reduced installation cost and raised power factor to unity.

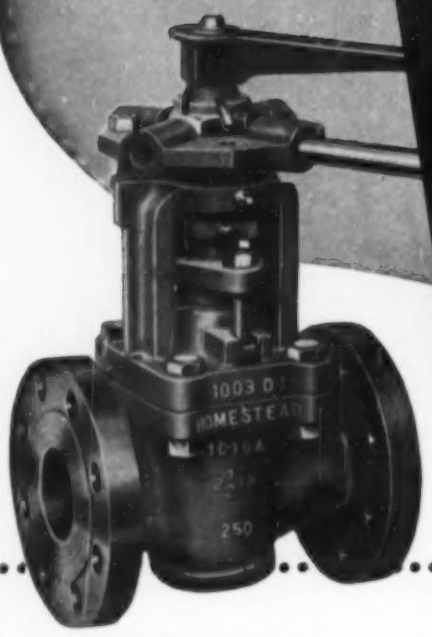


~~Corrosion~~...~~Temperature~~...~~Pressure~~

Can't faze

HOMESTEAD
Lever-Seald
VALVES

They're Stick Proof



- Instant Stick-Proof operation.
- Quarter-turn fully opens or closes.
- Positive seal without lubrication.
- Seating surfaces always protected in both open and closed positions. Corrosion practically eliminated.
- Unobstructed straight-line fluid flow.
- All operating parts protected from damaging effects of service conditions and weather.

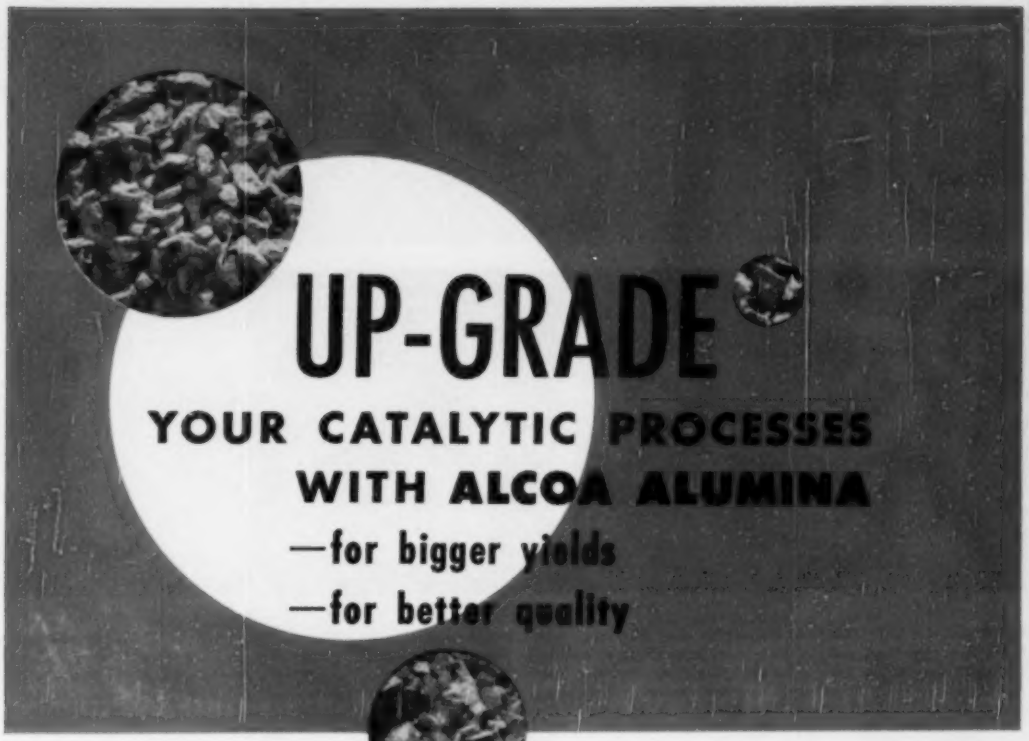
For 16 years, they have been first choice for difficult services where extremes of temperature or pressure or corrosive line fluids cause ordinary valves to "stick" or "seize." Due to their exclusive "Lever-Seald" construction, they render instant, Stick-Proof service. They operate fast, too . . . full open or close in a quarter-turn . . . 16 to 28 times faster than screw-stem-type valves. And because all operating parts are protected from the damaging effects of line fluids, service conditions and weather, long life, low maintenance and trouble-free service are assured.

HOMESTEAD LEVER-SEALD VALVES are made in metals and alloys to meet service requirements; sizes 1½" to 12"; for pressures from vacuum to 1500 pounds.

Send for your copy of Reference Book No. 39-3. No obligation.

HOMESTEAD VALVE MANUFACTURING CO.
Serving Since 1892

P. O. BOX 13 CORAOPOLIS, PA.



If you want to up-grade your catalytic process yields, or simply reduce losses from contamination and side reactions, you'll find it advantageous to insist on ALCOA Aluminas for your Al_2O_3 catalysts and catalyst supports.

ALCOA Aluminas are uniform in structure and chemical purity . . . stable at elevated temperatures . . . have high resistance to erosion and crushing . . . and are moderate in cost. Typical conversions for which ALCOA Aluminas are used include: *Aliphatic hydrocarbons into aromatics, and dehydrogenation of naphthenic hydrocarbons.*

★ **ALCOA *Activated* Alumina is preferred for many reactions because of its high adsorptive properties and extremely large surface area.**

★ **ALCOA *Tabular* and other forms of Alumina are preferred for certain reactions where hardness and extremely high purity are relatively more important than maximum surface area.**

For top quality, specify ALCOA Aluminas for catalysts and catalyst supports. You'll get more efficient, uniform reactions and end-products of higher purity. We'll gladly send you samples and further information.

ALUMINUM COMPANY OF AMERICA,
CHEMICALS DIVISION, 602B
Gulf Building,
Pittsburgh 19,
Pennsylvania

ALCOA

ALCOA CHEMICALS
ALUMINAS AND FLUORIDES

ACTIVATED ALUMINAS • CALCINED ALUMINAS • LOW SODA ALUMINAS • TABULAR ALUMINAS • HYDRATED ALUMINAS
ALUMINUM FLUORIDE • SODIUM FLUORIDE • SODIUM ACID FLUORIDE • FLUOBORIC ACID • CRYOLITE

Life ...on the

THREE BILLION GREETING CARDS annually find their way into Uncle Sam's mailbag, making the consumption of paper for this purpose quite an item. One of the ingredients important to papermakers who wish to impart high brightness value to their sized papers is ACCOBRITE* Rosin Size, newest and brightest of the rosin sizes. Available in liquid form, the ACCOBRITE sizes join an extensive line of high quality Cyanamid paper chemicals. These include wax sizes, wet-strength resins, caseins, sulfonated oils, defoamers, wetting agents, alum, soda ash, caustic soda, salt cake, acids and clays. (P.S. Don't forget February 14th.) *Trademark

EXTINGUISHING AN UNDERGROUND FIRE near Pottsville, Pa., was recently accomplished with the aid of Cyanamid explosives. When a vein of hard coal became ignited, the fire progressed underground, threatening a nearby coal mine and endangering the city of Pottsville. Cyanamid's explosives engineers directed operations in which an area of approximately 6,500 square feet of overburden was removed from above the underlying seam and the burning coal was scooped out and soaked with water. This is a dramatic illustration of one of the ways modern explosives can be made to serve our industrial needs.

HEAT TREATING OF MEDIUM AND HIGH CARBON steel parts such as those shown above usually calls for a salt bath that will resist decarburization even under the severest operating conditions. Cyanamid's new AEROHEAT® 1190, an improved neutral type salt bath, is ideal for hardening carbon and alloy steels, reheating carburized work, annealing, brazing and for other operations. AEROHEAT 1190 is the newest in Cyanamid's complete line of quality salt baths developed to meet every need.

Chemical Newsfront

NEW USE FOR NEOPRENE RUBBER: the soles of work-shoes where sure grip and good wearing qualities are essential. An important ingredient in compounding this sturdy chemical- and heat-resistant rubber is magnesium oxide, K & M Brand Magnesium Oxide, supplied by American Cyanamid Company, well known for its high quality and consistent uniformity. Further information on this product for use in neoprene formulations will be supplied on request.

New Literature Available from Cyanamid

New additions to the technical literature available from Cyanamid are listed below. Check over this list. You may find one or more will be of special interest. Then write for copies of those you want. They are available without charge:

☐ 1

COLLECTIVE VOLUME I of New Product Bulletins giving technical information and data on a group of new synthetic organic compounds which offer interesting possibilities for organic synthesis.

1

☐ 2

THE CHEMISTRY OF GUANIDINE, a handy reference covering properties, many typical reactions and suggested uses for this important nitrogen derivative. A copy belongs in every library on nitrogen chemistry.

2

☐ 3

PRODUCTS AND SERVICES OF AMERICAN CYANAMID COMPANY — Second Edition. A new composite listing of the various products supplied by the divisions of Cyanamid to meet the needs of Industry and Agriculture. A worthwhile guide to those seeking sources of supply or service information.

3

☐ 4

"PLASTICS NEWSFRONT", a bi-monthly publication issued by Cyanamid's Plastics and Resins Division, reporting news and information of general interest in the field of molded and laminated plastics.

4

AMERICAN Cyanamid COMPANY

30 ROCKEFELLER PLAZA · NEW YORK 20, N. Y.

new

FLEXIBLE HOSE

made from

. . . CARPENTER STAINLESS No. 20

This length of 1¼″ I.D. (.025″ wall) flexible hose is the first of its kind, made from Carpenter's super corrosion-resistant Stainless No. 20.

This new hose will be particularly useful in applications where full corrosion resistance must be combined with flexibility . . . such as on equipment which vibrates, and where connections are used between movable parts or machines. Fluid line connections, and mechanical parts which must flex, are additional uses being developed.

Present size range of Carpenter Stainless No. 20 Flexible Hose is from 1″ to 2⅝″ I.D. Standard pipe size nipples can be welded to the ends, as shown here.

For technical data and recommendations on use of this new flexible hose, write to Carpenter's Engineering Department outlining your problem. A bulletin describing the corrosion-resisting properties of the material will be sent upon request. Just write a note on your company letterhead and ask for the Carpenter Stainless No. 20 Bulletin.

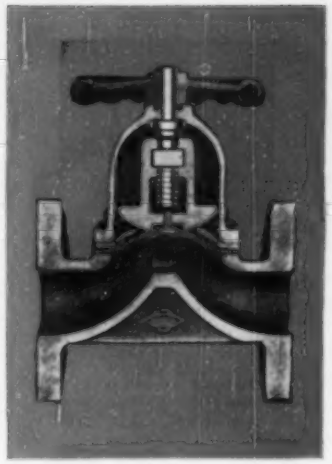
THE CARPENTER STEEL COMPANY · Alloy Tube Division
105 Springfield Road · Union, New Jersey

Export Department: 253 Broadway, New York 7, N.Y. "CARSTEELCO"

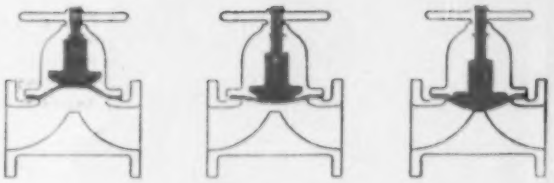
Carpenter

STAINLESS TUBING

"MORE THAN CORROSION RESISTANCE"

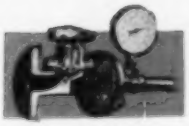


If you need a diaphragm valve you need all the advantages of diaphragm closing



Check these popular features of

GRINNELL-SAUNDERS DIAPHRAGM VALVES



Diaphragm gives leak-tight closure against grit, scale, solid matter . . . Even when something as substantial as an 8-penny nail is trapped on the weir of a rubber lined valve, as illustrated, the resilient diaphragm, plus the large area of contact, gives leak-tight closure against pressure or vacuum.

Diaphragm lifts high for streamlined flow in either direction . . . Smooth, streamlined passage, without pockets, prevents trapping of sludge and reduces frictional resistance to a minimum—irrespective of direction of fluid flow. No disc holder in fluid stream. Grinnell-Saunders Diaphragm Valves are self-draining when installed with the spindle at 15 degrees above the horizontal position.

Diaphragm absolutely isolates working parts from fluid . . . There's no "if" about the way a continuous, one-piece diaphragm seals off the working parts from fluids; no perforation or puncture in the diaphragm where fluid or gas can possibly leak by the valve spindle. No sticking, clogging or corroding of working parts. Valve lubricant cannot contaminate the fluid in the line.

Diaphragm, body and lining materials to meet particular conditions . . . Bodies stocked in cast iron, malleable iron, stainless steel, bronze and aluminum: other materials on special orders. Valve bodies lined with lead, glass, natural rubber or neoprene. Diaphragm materials of natural rubber or synthetics. Working pressure, 150 lbs.; maximum temperature, 180°F.

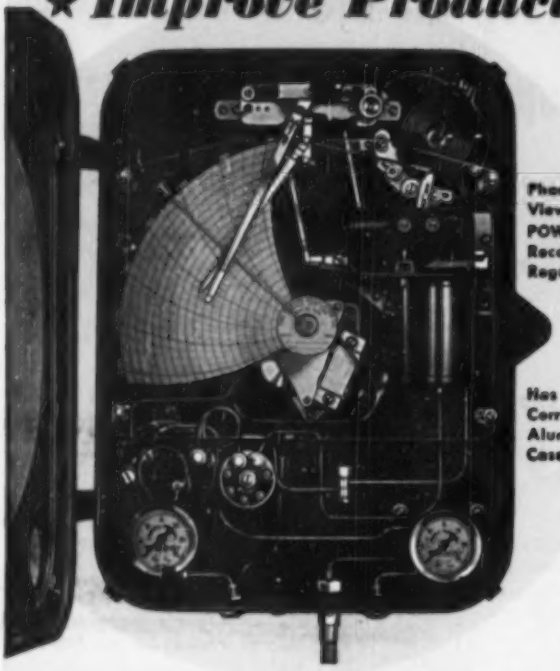
Diaphragm is only part that normally wears and needs replacement . . . Depending on the type of service, it may last for years, particularly since the compressor and finger plate combine to support the diaphragm in all positions. The diaphragm can be replaced quickly without removing valve from line. No refacing or reseating. No disc holder to require tightening or replacing. No packing glands to demand attention.

Write today for the new Grinnell-Saunders Diaphragm Valve Catalog 4-S.

GRINNELL

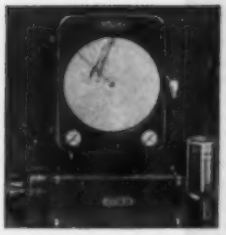
Grinnell Company, Inc., Providence 1, R. I. Warehouses: Atlanta • Buffalo • Charlotte • Chicago • Cleveland • Cranston • Fresno • Kansas City • Houston • Long Beach Los Angeles • Milwaukee • Minneapolis • New York • Oakland • Philadelphia • Pocatello • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane

★ REDUCE COSTS
★ Improve Production

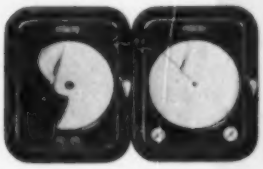


Phantom View of POWERS Recording Regulator

Has Non-Corrosive Aluminum Case



ABOVE: POWERS WET and DRY BULB RECORDING REGULATOR. Also available as a recorder only. Unit consists of two pen recording thermometer, water pan and motor blower causing sufficient circulation to give proper wet bulb readings.



ABOVE: POWERS TIME CYCLE RECORDING REGULATOR. Cam with cam follower operates steam control valve to correspond with any pre-determined time temperature schedule. Recording thermometer chart record provides a check on the operation of the control.

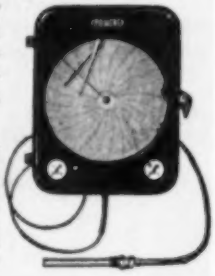
with precision control by—

POWERS

Air-Operated
INDICATING AND RECORDING REGULATORS

For TEMPERATURE • HUMIDITY • PRESSURE

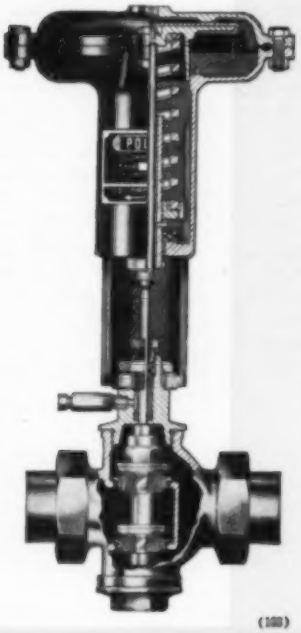
End losses caused by OVER-heating of processes or operations requiring precise control. Install POWERS pneumatic regulators. Their accurate control helps to improve quality of products—speed up production and save steam wasted by overheating.



Variety of Models: Recording Thermometers; Recording Regulators; Indicating Regulators; Wet and Dry Bulb Recording Regulators; Time Cycle Recording Regulators; Master and Sub-Master Indicating and Recording Regulators, etc.
Write for Bulletin 370.

For Better Temperature and Humidity Control and valuable aid in selecting the right instruments for your requirements—phone or write our nearest office. There's no obligation. The Powers Regulator Co., 2793 Greenview Ave., Chicago 14, Ill. • 231 E. 46th St., New York 18, N.Y. • 1808 W. Eighth St., Los Angeles 5, Calif.

THE POWERS REGULATOR CO. • OFFICES IN 50 CITIES



(188)

ABOVE: POWERS FLOWRITE VALVE

For Quiet Engine and Compressor Operation

Install BURGESS-MANNING SNUBBERS

To reduce engine exhaust and compressor intake noises, Burgess-Manning Snubbers are the answer. Turbulent slugs of hot exhaust gas or incoming pulses of air are snubbed so that the oscillating flow of gas, which causes noise, is smoothed to a unidirectional flow without appreciable restriction. The flow of gas from the engine, or the flow of air into the engine or compressor becomes smooth and quiet.

For a solution of your noise or gas surging problems, consult Burgess-Manning engineers.

APPLICATIONS

- Drilling
- Oil well pumping
- Crude oil and product pipe lines
- Gas transmission
- Repressuring
- Recycling
- Refineries
- Gasoline plants

SDG Slug Buster Snubber

Burgess-Manning Snubbers on Fluid Catalytic Cracker

From the Producing Well, through the Refinery Gate . . . It's Burgess-Manning

Recycling Plant

Two Burgess-Manning Exhaust Snubbers outside recycling plant.

Rotary Drilling Engines

Burgess-Manning Snubbers on rotary drilling engines at Shawnee Drilling Co., Shawnee, Oklahoma.

Oil Pumping Station

Three Burgess-Manning Snubbers on engines at Shell Oil plant in California.

Pipe Line

Burgess-Manning Exhaust Snubbers on pipe line engines.

Portable Drilling Rig

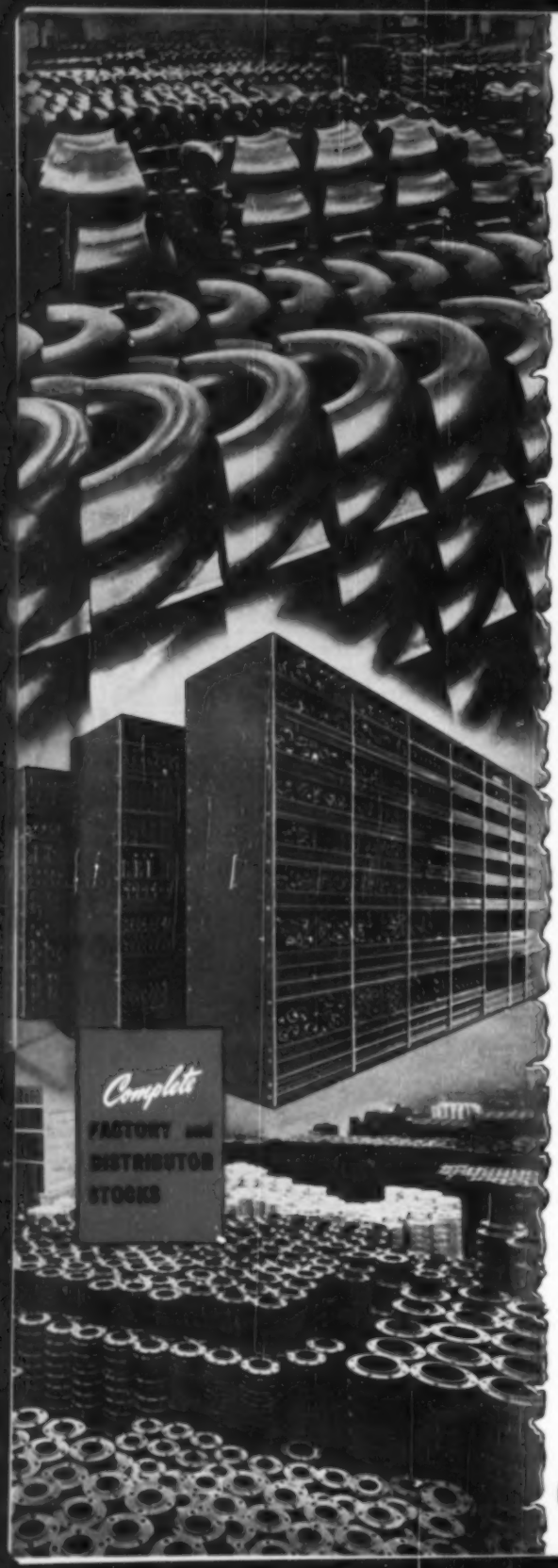
Portable oil rig using Burgess-Manning Snubber.

Write for Bulletin

Bulletin No. 497 features Burgess-Manning's new SDG Slug Buster Snubber.

BURGESS-MANNING COMPANY

LIBERTYVILLE, ILLINOIS



all three on one order from Ladish

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TO MARK PROGRESS

every piping system deserves the protection

SEAMLESS WELDING FITTINGS—½ INCH THRU 30 INCHES

FORGED STEEL FLANGES—½ INCH THRU 30 INCHES—LARGE O.D. THRU 96 INCHES

FORGED STEEL FITTINGS—SCREWED AND SOCKET WELDING—⅛ INCH THRU 4 INCHES

All Available in

CARBON
ALLOY
STAINLESS STEELS
ALUMINUM
COPPER & OTHER
NON-FERROUS
METALS

Means savings in time and dollars...for LADISH offers you a complete line backed with adequate stocks

Whatever your fitting requirements... you can rely on the Ladish line for an unrestricted selection of Seamless Welding Fittings, Forged Steel Flanges and Forged Steel Fittings.

This Controlled Quality line is complete in types, size ranges and materials you need for virtually any application. Ladish also gives you such outstanding engineering developments to improve piping efficiency, as Seamless Reducing Elbows and Full Branch Taper Design Tees.

Adequate stocks in strategically located distributor warehouses... supplemented by extensive factory inventories of every type... give you double assurance of prompt service on every Ladish order. And, by standardizing on Ladish you know that every fitting is made to the unsurpassed standards of Controlled Quality for complete dependability.

of *Controlled Quality* fittings

A COMPLETE LINE PRODUCED UNDER ONE ROOF
...ONE RESPONSIBILITY

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Two New Ways to SLASH SHIPPING COSTS!

1. Steel Drums...

2. Fiber Containers...

with VISQUEEN* film liners mean big savings to chemical industry

HOW?

Steel drums lined with strong Visqueen film liners make possible complete product recovery at destination.

There is no loss of product. And no cleaning or reconditioning of drums is required. Zip out liner—drums go back into service immediately!

Your investment in containers is smaller. A smaller number of containers does the job.

HOW?

You can effect almost unbelievable savings in tare weight—and savings in shipping costs.

On typical carload shipment from California to Chicago, tare weight savings totalled 5,400 lbs. In terms of dollars that was $105.84 saved by the shipper. Such savings go all the way down the line. There is also less handling expense, trucking and other transportation costs. Shipper mentioned reported annual total savings of $50,000.

THIS NEW METHOD of shipping is particularly successful in the chemical field. Good reasons: Visqueen film is 100% pure, protects purity of product it contacts. It has a high 0^2 transmission rate—a low H_2O rate. Ideal for hygroscopic materials and most acids and alkalis don't affect Visqueen film. Get full details in Manual offered here.

VISQUEEN film... a product of The

VISKING CORPORATION

PRESTON DIVISION, TERRE HAUTE, INDIANA

*T. M. The Visking Corporation

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JUST OFF THE PRESS

Shows how to save money! Get your copy of "A Manual of Technical Information Regarding VISQUEEN film Drum Liners."

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Preston Division, Box D-1410, Terre Haute, Indiana

I'd like to have a copy of the new VISQUEEN technical manual that shows how to save money on every shipment of our products.

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Question: Is ion exchange— OLD ? NEW ?

Answer: Ion Exchange is BOTH

OLD in principle

NEW in usefulness

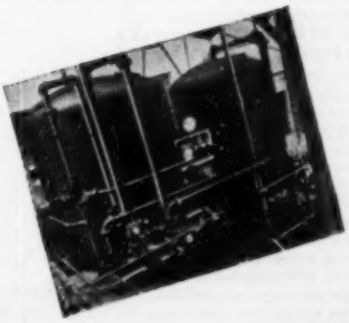
Permutit Manufactured the First Ion Exchanger Over 36 Years Ago

In 1913, more than 36 years ago, Permutit introduced the first commercial ion exchanger (or zeolite as it was then called) in America. Through the years Permutit has continually introduced new ion exchangers to help solve water conditioning problems in every field.

Permutit Continues Pioneering Profitable New Ion Exchange Applications

Here are just a few of the profitable new processes made possible by ion exchange: Removal of formic acid from formaldehyde solutions. Recovery of metals from waste. Purification of solutions of organic compounds, such as sugar and alcohols. Concentration of organic bases including alkaloids and amines. Manufacture of colloidal silica.

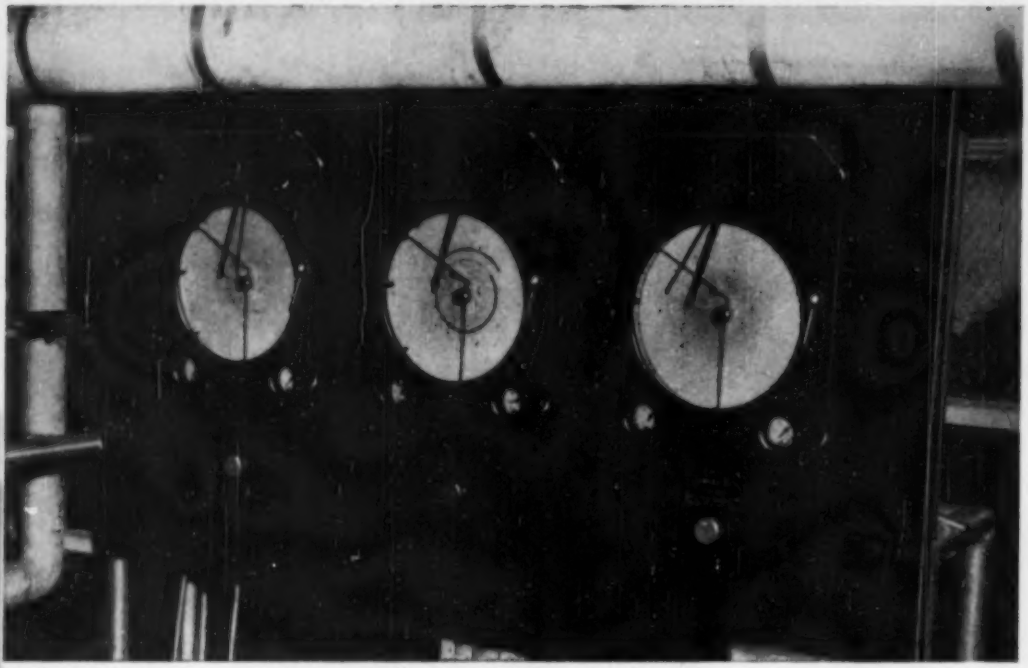
Permutit is today's sole manufacturer of all types of ion exchangers and the equipment for their use. Write for full information about these profitable new applications to The Permutit Company, Dept. CE-2, 330 West 42nd Street, New York 18, N. Y., or to The Permutit Company of Canada, Ltd., Montreal.



Permutit

FOR OVER 36 YEARS

WATER CONDITIONING HEADQUARTERS



Taylor temperature, pressure and flow controllers on Merck & Co., Inc., Streptomycin process at Rahway, N. J., plant

Taylor Fulscope Controllers help mass produce* STREPTOMYCIN *for* MERCK

* Registered Trade Mark

TAYLOR INSTRUMENTS are helping Merck & Co., Inc., bring cure and new hope to people who suffer from tuberculosis, meningitis, peritonitis, and other serious diseases. The story begins in 1944 when Rutger's professor Selman A. Waksman isolated and studied Streptomycin. He suggested to Merck & Co., Inc. that they produce enough of his new antibiotic for a thorough investigation.

But after one year of pilot plant operation, there still wasn't enough of the precious drug to meet the demand—even for research. Merck & Co., Inc., then decided to install equipment for a mass production method. They called on Taylor for the automatic instrumentation needed to run this process on a practical basis.

The critical processes require the use of temperature, pressure, and rate of flow controls, to prevent contamination and waste of materials and to maintain consistent top quality. One of the most critical is the fermentation phase of the process. Here Fulscope temperature controllers assure thorough sterilization of the processing equipment as well as maintaining optimum temperatures during fermentation of the broth. In addition, instrumentation at Merck relieves the operators of responsibility for product quality and frees them for other important duties.

At the present rate of production millions of pounds of materials, including solvents which are recovered, and millions of gallons of process water are required every month. In the face of this enormous investment in raw materials, the efficiency assured by instrumentation becomes an absolute necessity. And this efficiency allows Merck to mass produce this precious drug—making more of it available to more people at a lower cost.

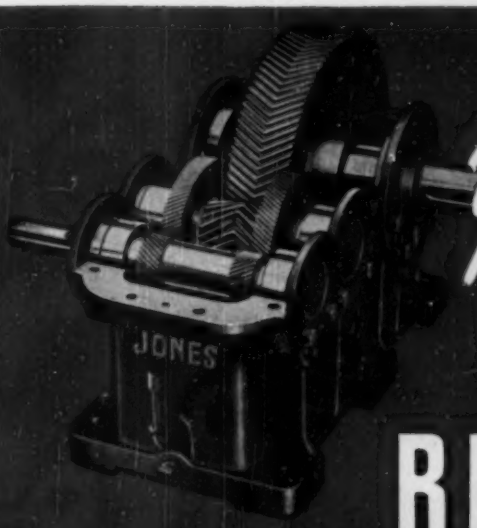
This is one among hundreds of examples of Taylor Instruments helping keep quality up and costs down in vital process industries. May we help you?

Taylor Instrument Companies, Rochester, N.Y., and Toronto, Canada.

• • •

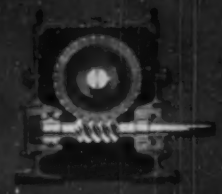
Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.

TAYLOR INSTRUMENTS MEAN ACCURACY FIRST



Your kind of...

SPEED REDUCERS



When you want a speed reducer you want the type that will best handle your particular drive problem . . . and you want a reducer that will "stand the gaff." Jones reducers measure up to both of these standards.

It makes no difference whether you require herringbone, spur or worm gear reducers, the Jones organization can give you just what you need in any ratio and capacity . . . and over the years Jones reducers have shown the ability to "take it" under the most severe operating conditions.

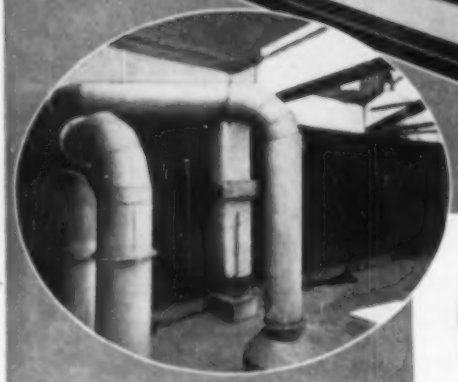
Jones offers your kind of speed reducers to solve your kind of drive problems.

W. A. JONES FOUNDRY & MACHINE CO.
4415 Roosevelt Road, Chicago 24, Ill.

Jones

HERRINGBONE — WORM — SPUR — GEAR SPEED REDUCERS
PULLEYS • GEARS • V-BELT SHEAVES • ANTI-FRICTION
PILLOW BLOCKS • FRICTION CLUTCHES • FLEXIBLE COUPLINGS

View of top of tower, showing fan guards



Air inlet louvres shown in photo are heavy 1" x 8" California Redwood.

This C. H. Wheeler water cooling tower serves the air conditioning system installed in the new plant of the **Smith, Kline and French Laboratories, Philadelphia, Pa.** Responsible for this new building and its air conditioning system were The Ballinger Co., architects; Riggs, Distler & Co., Inc., contractors; and Barclay, White & Co., builders. Carrier Corp. furnished the refrigeration machinery.

HIDDEN COOLING TOWER

Preserves Building Appearance; Still Does Its Job

To look at it you'd never believe there's a water cooling tower serving the air conditioning system for this modern pharmaceutical plant. Even after a second look, you won't find it because it is "camouflaged" into the very top of the building itself. The tower is ruggedly constructed of Construction Heart Grade of California Redwood with an outer casing of brick to match the building's architecture. This cooling tower carries the same guarantees as any other C. H. W. tower, including guaranteed fan horsepower and guaranteed water cooling performance—and yet with a harmonizing casing for appearance as well as safety to meet city fire regulations. When you need a cooling tower for air conditioning or any other application, consult C. H. Wheeler for a custom-built job. Write for descriptive literature.

C. H. WHEELER MANUFACTURING CO.
1808 Sedgley Avenue, Philadelphia 32, Pa.
REPRESENTATIVES IN MOST PRINCIPAL CITIES

SINCE 1903

C.H. Wheeler OF PHILADELPHIA

STEAM CONDENSERS • WATER COOLING TOWERS
EJECTORS • STEAM JET VACUUM REFRIGERATION

Why you should specify...

HOOKER MURIATIC ACID

IF YOU MANUFACTURE DYES—because Hooker Muriatic Acid is free from sulfates, oxides of nitrogen and iron, impurities that cause precipitates or add unwanted colors to benzidene dye.

IF YOU ARE REFINING HIGHGRADE ORES—because Hooker Muriatic Acid is free from sulfates or sulfuric acid, that cause serious losses in extraction.

IF YOU ARE MAKING PHARMACEUTICALS OR FOOD STUFFS—because Hooker Muriatic Acid is free from sulfates, iron and arsenic, that cause insoluble precipitates, discoloration or contamination.

IF YOU ARE PICKLING OR CLEANING METALS – because Hooker Muriatic Acid is free from arsenic, that may react with liberated hydrogen to form Arsine (AsH_3).

IF YOU MANUFACTURE CHEMICALS—because Hooker Muriatic Acid is of such high quality that you get better yields of better quality and without harmful side reactions.

* * *

Hooker Muriatic Acid is available in two grades—commercial (light yellow color) and Hooker White—(colorless) both free from arsenic. It is shipped in carboys or tank cars and in three strengths, 18°, 20° and 22° Baume. Hooker Technical Data Sheet No. 720 gives Hooker specifications, dilution instructions and other valuable information. Send for a copy on your company letterhead.

From the Salt of the Earth

HOOKER ELECTROCHEMICAL COMPANY

HOOKER CHEMICALS

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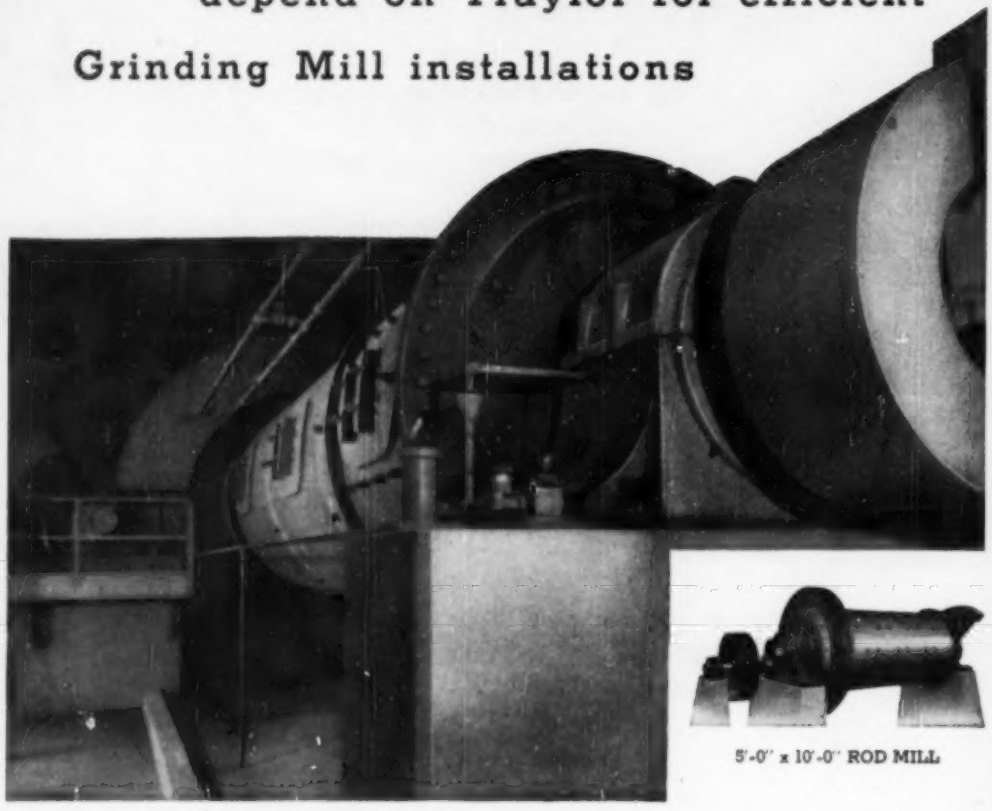
SODIUM SULFIDE • SODIUM SULFHYDRATE • SODIUM TETRASULFIDE • CAUSTIC SODA • MURIATIC ACID • PARADICHLOROBENZENE • CHLORINE

Here's why leading chemical processors depend on Traylor for efficient Grinding Mill installations



5'-0" x 10'-0" ROD MILL

More than 45 years of practical experience in making profitable grinding equipment is behind every grinding recommendation made by Traylor engineers. Through the years, Traylor has kept ahead of the industry's ever-increasing need for more efficient grinding. Built into Traylor Grinding Mills are features which permit economies in power requirements and maintenance costs and result in increased tonnage of proper fineness. These features, of which there are many, proven *in the field*, are the reasons for the acknowledged superiority of Traylor Grinding Mills. Choose the type of mill you need; Ball, Rod, Tube or Pebble, but choose a Traylor!

7'-0" x 5'-0" BALL MILL

Traylor

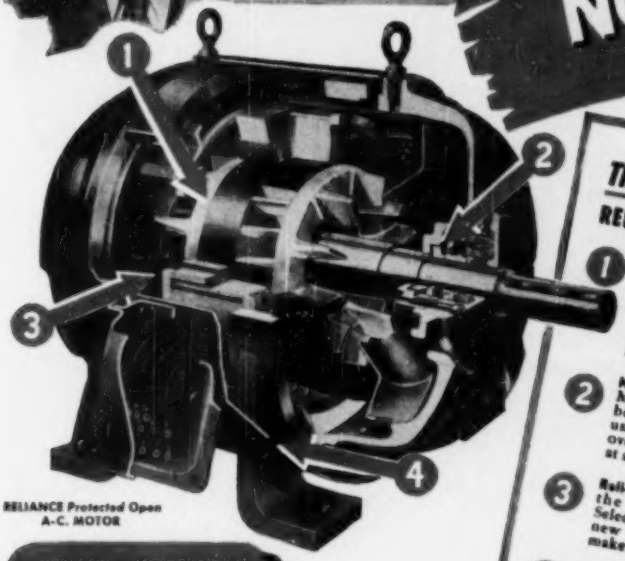
Rotary Kilns, Coolers and Dryers
Grinding Mills · Crushing Rolls
Jaw, Reduction and Gyratory Crushers

TRAYLOR ENGINEERING & MANUFACTURING CO.
115 Mill St., Allentown, Pa.

Sales Offices: New York, N. Y., Chicago, Ill., Los Angeles, Calif.
Canadian Mfrs: Canadian Vickers, Ltd., Montreal, P. Q.

A "TRAYLOR" LEADS TO GREATER PROFITS

"...all motors are NOT ALIKE"



RELIANCE Protected Open A-C. MOTOR

These 4 Advantages Alone make RELIANCE the motor that is different!

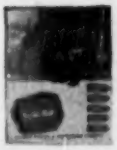
1. **Dynamic Balancing—Precision Fits**—Every motor is dynamically balanced by skilled technicians using latest electronic-principle equipment. Machining of parts to exacting tolerances guarantees precision fits throughout. Result: a smoother-running, longer-lasting motor!
2. **No Lubrication Worries**—Precision Bearing Mounting, with double-shielded ball bearings, assures longer bearing life under all normal conditions, whether overgreased, undergreased or not greased at all. "*You can't grease 'em wrong.*"
3. **Rel-X Insulation** furnishes a new high in the protection of stator windings. Selected materials, exclusive methods and new continuous-sequence applications make this the *unfailing* insulation!
4. **Steel for Strength**—Steel construction, with electrically welded joints, combines maximum strength with minimum weight.

RELIANCE *Precision-Built* **MOTORS**

...are made *better* to deliver DEPENDABLE POWER—LONGER!

Reliance has a way of building motors that must be seen to be fully appreciated. Any time we can take a motor user through the modern plants where Reliance *Precision-Built* Motors are made, we can be reasonably sure of another good Reliance customer. We would be delighted to have you make this visit. But if it isn't practical, call in your nearest Reliance representative and *see* the convincing facts he can show you on the precision methods that produce these truly superior motors. Now available from ¾ to 300 horsepower.

HOW TO SELECT THE RIGHT MOTOR



Here's a book which digests all the information you should have in selecting the motor that's just right for any job. New torque and current standards recently adopted by the National Electrical Manufacturers Association for A-c. motors are tabulated and explained. And these are further supplemented by more detailed performance data on Reliance *Precision-Built* Motors. Write today for this important new Motor Data Bulletin, B-2101.

Sales Representatives in Principal Cities

RELIANCE ELECTRIC AND ENGINEERING CO.

"Motor-Drive Is More Than Power" • 1062 Ivanhoe Road, Cleveland 10, Ohio

Now This Truck Does 10 Times More Work

In The DEMPSTER DUMPSTER SYSTEM

Picks-Up, Hauls, Dumps Four Railroad Cars of Materials Daily!

Before the Dempster-Dumpster Hoisting Unit was installed on the above truck chassis, it was one of 10 conventional trucks being loaded by hand. Now, the truck hoisting unit has replaced all 10 trucks. In many plants handling materials by the Dempster-Dumpster System, one Truck Hoisting Unit has replaced from 5 to 10 conventional trucks. In each plant a single hoisting unit handles many containers. In one particular installation, one unit serves 37 detachable containers of various types and sizes, ranging from 2½ to 8 cu. yds. This plant produces, daily, approximately 220 cu. yds. (about 4 car loads) of materials of every description, including rubbish, scrap and finished product. This daily output is handled in only eight hours by the Dempster-Dumpster equipment. Containers are spotted at materials' accumulation points throughout the plant. When each container is filled, it is picked up by the truck hoisting unit, carried to the point of disposal, set down intact or dumped and returned for refilling. The entire operation is hydraulically controlled and handled by only one man, the driver. This modern system is eliminating much equipment investment in industrial plants. It is cutting maintenance costs, tire and gas requirements. But, most important, it increases production with a minimum of manpower. Don't assume that your problem is different—that the Dempster-Dumpster System of materials handling is not applicable to your problem. Such cases have happened, only to discover later that this equipment was exactly the type needed. Our most difficult job in our advertising is to make the wide use . . . the flexibility and simplicity of the Dempster-Dumpster operation clear to the reader. It will pay you to investigate the Dempster-Dumpster System now! A product of Dempster Brothers, Inc.

Pictured at left is a standard drop bottom type container in three stages of operation—on the ground, in carrying position, and dumping.

DEMPSTER BROTHERS

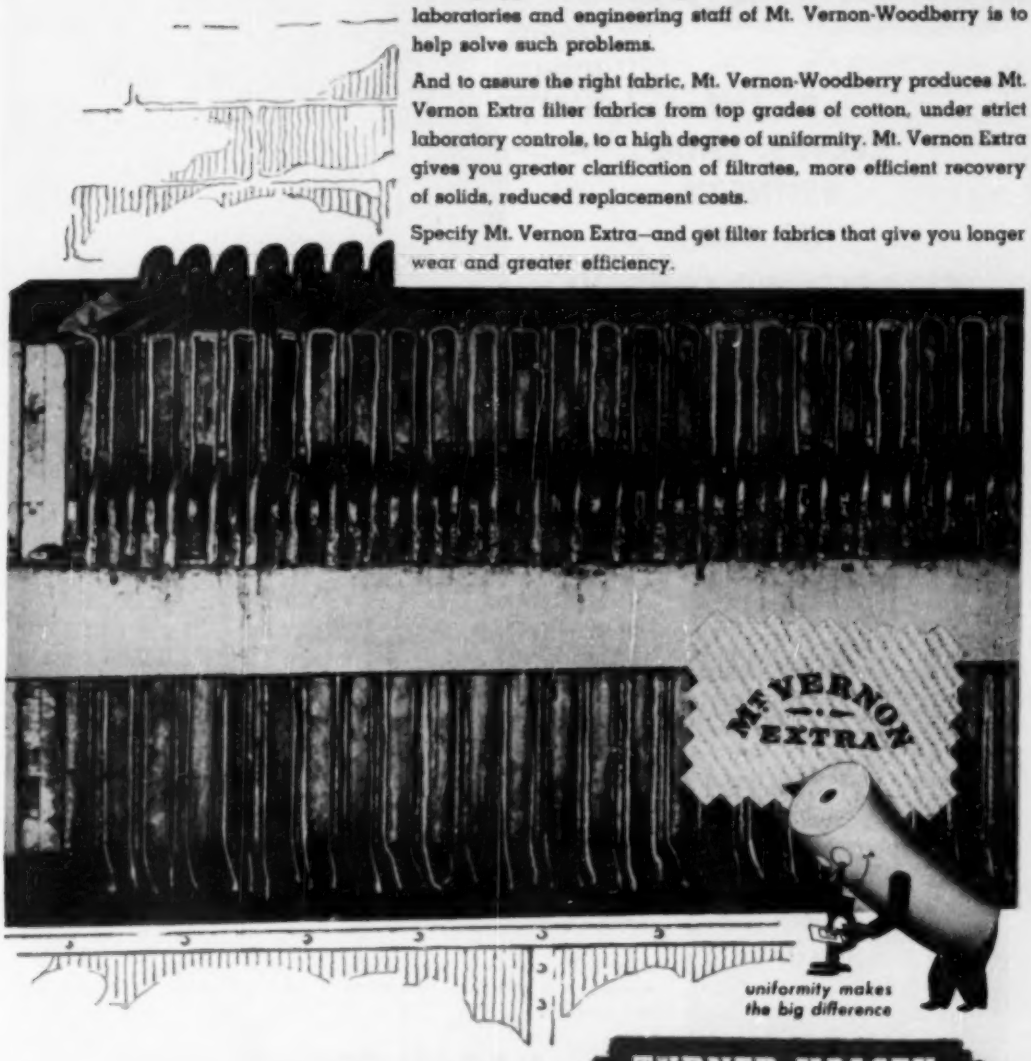
210 Dempster Bldg. **Knoxville 17, Tenn.**

Filter Fabrics that Fill the Bill ...Mt. Vernon Extra

There are few filtering problems that won't yield to a sound engineering approach and the right fabric. One of the functions of the laboratories and engineering staff of Mt. Vernon-Woodberry is to help solve such problems.

And to assure the right fabric, Mt. Vernon-Woodberry produces Mt. Vernon Extra filter fabrics from top grades of cotton, under strict laboratory controls, to a high degree of uniformity. Mt. Vernon Extra gives you greater clarification of filtrates, more efficient recovery of solids, reduced replacement costs.

Specify Mt. Vernon Extra—and get filter fabrics that give you longer wear and greater efficiency.



uniformity makes the big difference

Mt. Vernon-Woodberry Mills

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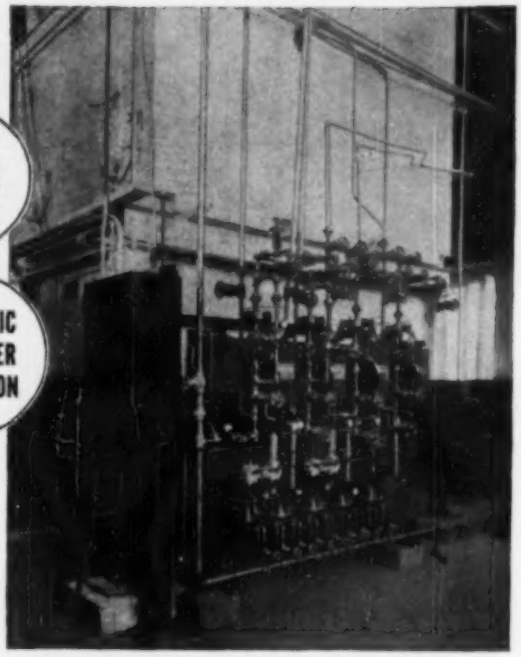
AUTOMATIC COMBUSTION CONTROL

RING BALANCE METERS

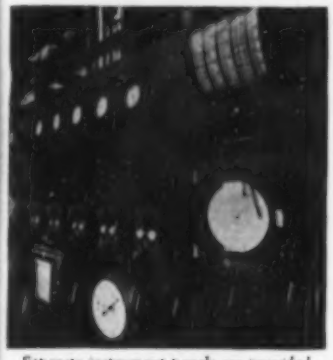
BY HAGAN

AUTOMATIC FEEDWATER REGULATION

AT THE CLEVES, OHIO, REFINERY OF THE GULF REFINING COMPANY

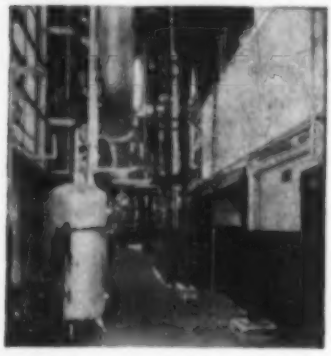


Components of the Hagan automatic feedwater regulation and combustion control systems are mounted at the side of each boiler, giving easy access for adjustment or servicing.



Separate instrument panels are provided for each boiler. Two Hagan Ring Balance Meters are mounted on each panel.

Below—General view showing front of boilers and instrument panels in Gulf Refining Company refinery at Cleves, Ohio.



Recent expansion of the refinery of Gulf Refining Company at Cleves, near Cincinnati, included the installation of two new boilers, each with a capacity of 70,000 pounds of steam per hour, and operating at 685 psi. Fuels used are refinery waste gas and oil, either singly, or in combination.

These new boilers are equipped with Hagan Automatic Combustion Control, Hagan Automatic Feedwater Regulation, and Hagan Ring Balance Meters.

The combustion control is a Hagan Differential Master system. With this system, waste gas is burned when available and is automatically supplemented or replaced by oil as necessary. Fuel feed is changed instantly to compensate for fluctuations in calorific value of fuel or changes in steam demand and excess air is automatically maintained in accordance with actual Btu. input.

Hagan Automatic Feedwater regulation is a multiple circuit system which proportions feedwater to steam flow and modifies feedwater flow in accordance with water level in the boiler. Thus the system not only holds water level accurately in a steady steaming state, but also "irons out" in an optimum pattern, the mutual disturbances existing between the steam generating circuits and the water flow circuits of the boiler in changing from one steam rate to another.

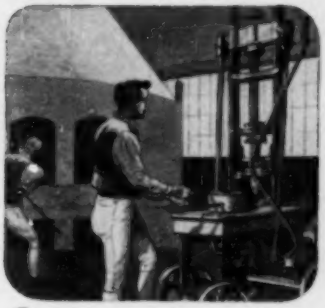
Two Hagan Ring Balance Meters are used with each boiler. One records steam flow, air flow and steam pressure; the other records feedwater flow and steam drum water level.

We will be glad to supply full information on Hagan Combustion Control, Hagan Automatic Feedwater Regulation and Hagan Ring Balance Meters. Write to Hagan Corporation, Hagan Building, Pittsburgh 30, Pa.

HAGAN CORPORATION

BOILER COMBUSTION CONTROL SYSTEMS
RING BALANCE FLOW AND PRESSURE INSTRUMENTS
METALLURGICAL FURNACE CONTROL SYSTEMS
THRUSTOR FORCE MEASURING DEVICES

1 **1621**—Glass was money! America's first glass factory was actually a mint—not for the manufacture of coins but to make glass beads for *use* as money when buying land, food and furs from the Indians.

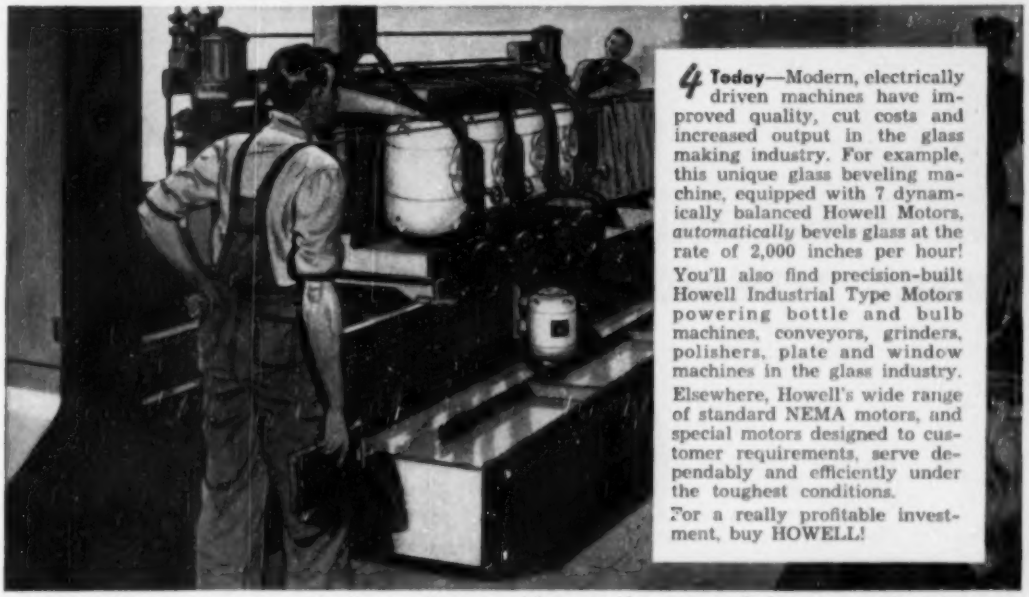


2 **1827**—Blown glass was the rule until Enoch Robinson, a carpenter, figured glass could be pressed into shape . . . the glass pressing machine was born. Electricity to power new machines was still to come.

3 **1899**—Owens invented a machine to make bottles as the machine age arrived in glass. By 1915, Howell "Red Band" Motors were making important contributions to this and other industries.

ANOTHER HOWELL SUCCESS STORY

GLASS...from artisans to automatic machines



4 **Today**—Modern, electrically driven machines have improved quality, cut costs and increased output in the glass making industry. For example, this unique glass beveling machine, equipped with 7 dynamically balanced Howell Motors, *automatically* bevels glass at the rate of 2,000 inches per hour!

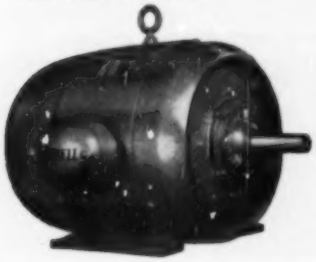
You'll also find precision-built Howell Industrial Type Motors powering bottle and bulb machines, conveyors, grinders, polishers, plate and window machines in the glass industry.

Elsewhere, Howell's wide range of standard NEMA motors, and special motors designed to customer requirements, serve dependably and efficiently under the toughest conditions.

For a really profitable investment, buy HOWELL!

Free enterprise encourages mass production, supplies more jobs—provides more goods for more people at less cost.

Howell totally enclosed, fan-cooled motor—windings completely sealed against dirt and weather.



HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Precision-built Industrial Motors Since 1915

How long

<u>is</u> a lifetime

in Stainless Steel?

We call Allegheny Metal "the time-tested stainless steel" because it's the pioneer in America, but time hasn't really tested it yet. Neither we nor anyone else knows how long stainless steel will last. The earliest installations of Allegheny Metal—made more than 20 years ago—are just as bright, strong and resistant as when new. How can you defeat a metal that doesn't wear out and can't wear off? • More important, how and where can you *use* it to advantage, *today?*

W&D 8179

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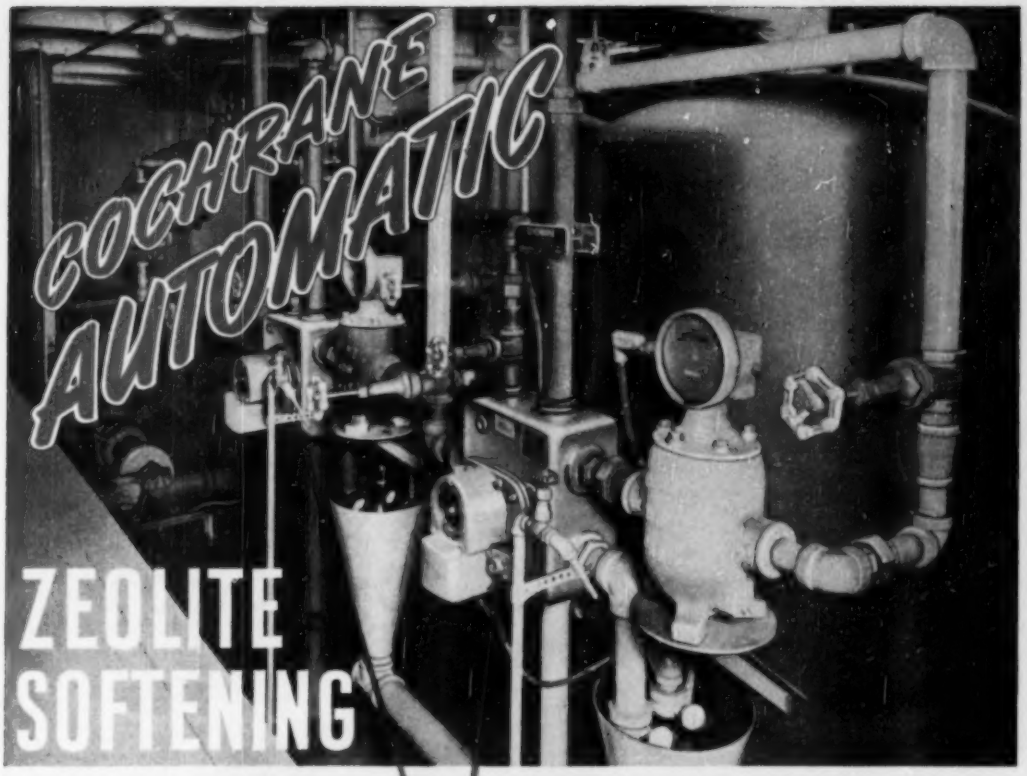
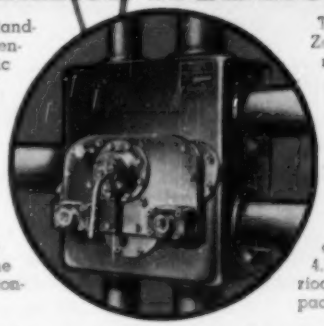


with the COCHRANE HYDROMATIC VALVE

The new Cochrane Hydromatic Valve standard equipment on Cochrane Zeolite Softeners, is readily adaptable to automatic control. This is a fact of prime importance to any user of zeolite softeners for, with the Hydromatic Valve, no change in the physical plant is necessary—merely the simple addition of a control box and a small 1/30 H.P. drive motor.

Automatic operation of Zeolite Softeners makes possible economies in the amount and cost of the zeolite materials that often offset the cost of the control accessories, aside from the convenience of the automatic operation.



The points in favor of Cochrane Automatic Zeolite Softening System with the Hydromatic Valve are these:

1. Simplest and most positive single control valve ever built—six valves in one.
2. Automatic Control with the Hydromatic Valve means merely the addition of control box and a small 1/30 H.P. drive motor—no changes in the physical plant.
3. Cost of labor attendant on manual operation is eliminated.
4. No objection to shorter regeneration period permitting savings on amount and capacity of zeolite materials.

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In Canada: Canadian General Electric Company, Ltd., Toronto

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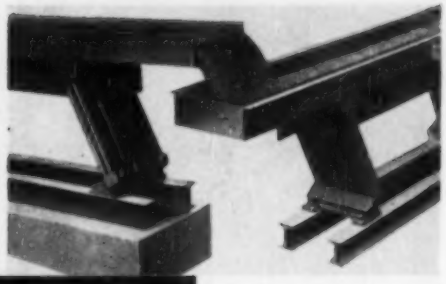
Handle Bulk Materials by



Mechanical VIBRATION

with the JEFFREY MV Conveyor

It's New. Handles all kinds of bulk materials — dry or wet, hot or cold, fine or coarse, abrasive, lumpy or rough. Operates on a system of balanced forces (natural frequency) — mechanical instead of by electric impulse. Large power savings.

This NEW Jeffrey MV Conveyor conveys chemicals or feed products horizontally, downhill or uphill as steep as 10°. The V-belt drive unit with a floating eccentric shaft will operate two equal lengths of conveyor sections up to 80 feet. May be floor or suspension-mounted — open, closed or tubular decks. Vibration is isolated to the machine itself. Bulletin No. 826 goes into detail.

(Patent Pending)

THE JEFFREY MANUFACTURING COMPANY

Established 1877

909 North Fourth St., Columbus 16, Ohio

Baltimore 2	Chicago 1	Detroit 13	Jacksonville 2	Pittsburgh 22
Birmingham 3	Cincinnati 2	Harlan	Milwaukee 2	St. Louis 1
Boston 16	Cleveland 13	Houston 2	New York 7	Salt Lake City 1
Buffalo 2	Denver 2	Huntington 19	Philadelphia 3	Scranton 3

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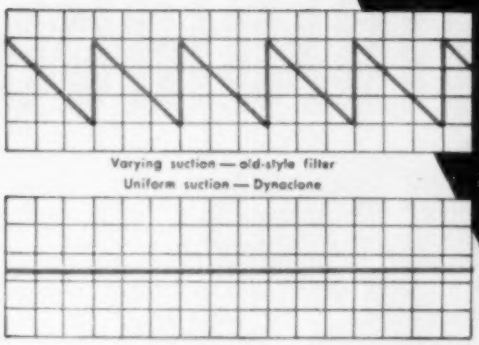
Complete Line of Material Handling, Processing and Mining Equipment

NEW! NEW!

NEW Cloth Screen Dust Filter

SLY DYNACLONE*

offers 5 NEW ADVANTAGES!



Varying suction — old-style filter

Uniform suction — Dynaclone

1. Eliminates mechanical shaking.
2. Provides uniform suction at dust source.
3. Assures longer bag life . . . 4. minimum maintenance.
5. Keeps itself automatically and continuously clean without additional power or equipment.

Send for descriptive bulletin just out on the new Sly Dynaclone — the ultimate in filter performance.

This revolutionary new dust filter is another Sly first. Extremely simple and thoroughly dependable, it eliminates entirely the gremlin of mechanical shaking and provides uniform suction of air at dust source.

This uniform suction is achieved by a simple device which cleans the filter bags successively by a reverse flow of air—the same suction which draws the dust onto the filter cloth is reversed to blow it off.

Since this reverse air suction operates continually, the new Sly Filter requires no shutdowns for removing dust from the cloth.

No mechanical shaking or flexing device is needed, eliminating all strain and wear on the filter bags.

The simplicity of design and operation and elimination of all auxiliary equipment for periodic cleaning of bags mean a saving of floor space and a very minimum of maintenance.

The result of long experimentation and exhaustive tests, the Sly Dynaclone has thoroughly proved itself. It provides substantial savings over any other type of cloth screen dust collection. Write for complete information.

*Patent Applied for

SLY PIONEERS and LEADERS in INDUSTRIAL DUST CONTROL

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in Mechanical Drive Turbines

TYPE DP

For flexible speed control, performance accuracy, and on-the-job reliability, you can't beat a General Electric standard DP turbine with its totally-enclosed hydraulic governing system.

This pressure-relayed system gives you ease and accuracy of control that compares with the precision speed governing of large central station turbines. Yet the DP is a standard design, sold at standard prices.

YOU GET A WIDE SPEED RANGE—30% adjustment for flexibility of operation. This feature, combined with the wide variety of ratings and speeds available, provides you with the "right" turbine for any job.

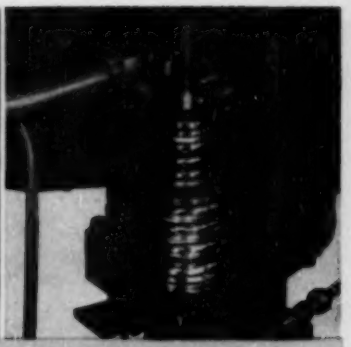
YOU GET PERFORMANCE ACCURACY—6% regulation means holding the speed you want on important processes. Regulator control is available for governing in terms of any process requirement.

YOU GET GREATER RELIABILITY—the hydraulic governing system keeps moving parts to a minimum, operates in an oil atmosphere with no exposed linkages. This eliminates wear and corrosion, assures dependable operation.

Check the features of the standard DP. It can give you the kind of precision performance you're looking for, the savings in operating costs that boost profits. Contact your nearest G-E sales office, or write for bulletin GEA-4955A. Apparatus Dept., General Electric Co., Schenectady 5, N. Y.

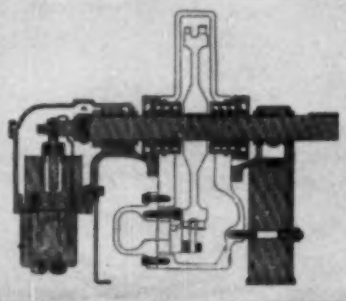
In this plant, a General Electric 30-hp DP turbine is coupled to a centrifugal pump. The hydraulic governing system provides accurate, reliable performance over a wide range of speed adjustment.

This turbine-type oil pump, gear driven from the main shaft, signals any tendency for the DP to speed up or slow down with changes in load. The pump also provides oil pressure for positioning the governor valve.



Acting on the speed signal from the oil pump, this pressure relay controls the amount of oil pressure in the operating cylinder. This cylinder regulates the amount of steam admitted to the turbine through the governing valve.

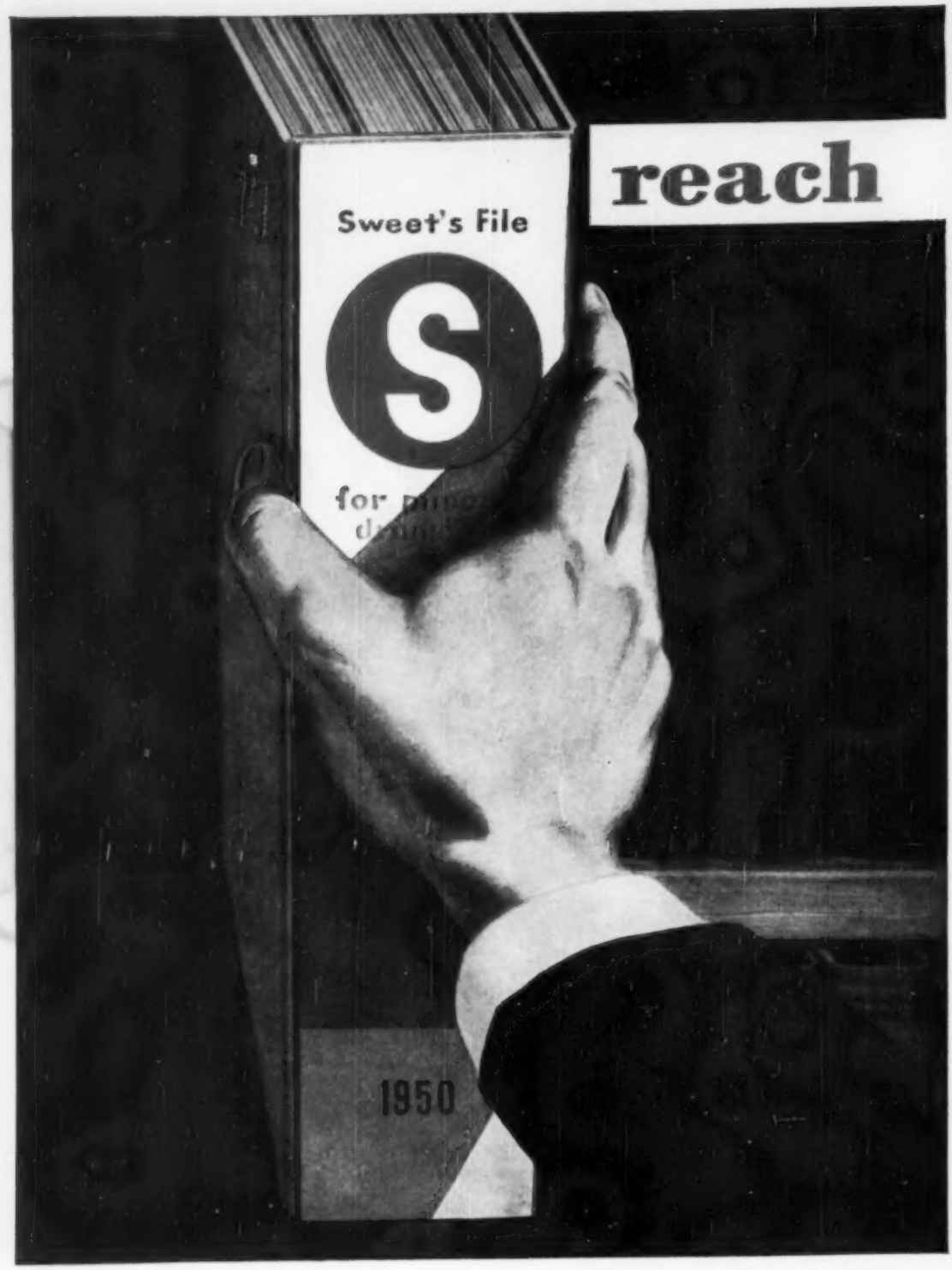
HYDRAULIC GOVERNING makes a difference



Here's What Standardization Provides For You

In the diagram at the left, all shaded parts are interchangeable on all sizes of DP turbines. Thus, it is easy to stock spares, and maintenance costs are reduced. All models have standard shaft height and coupling fits for easy installation or re-location in your plant. Standardization cuts manufacturing expense and the savings are passed on to you in the form of extra features usually found only on "special" turbines.

GENERAL ELECTRIC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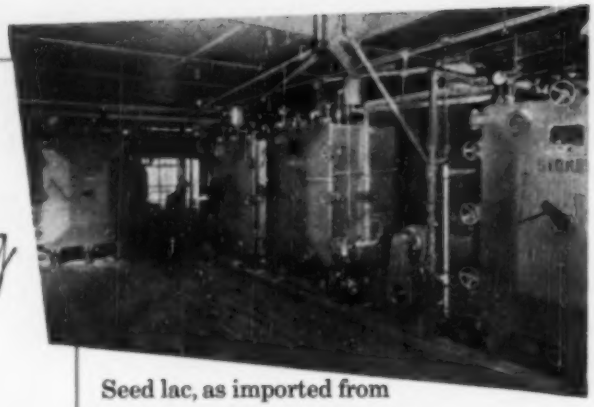
Vacuum Drying saves 66 hours

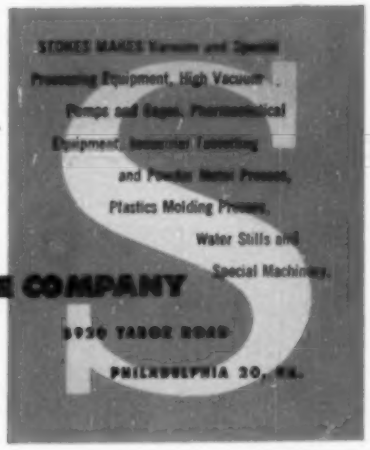


Seed lac, as imported from India, is prepared for commercial use as bleached shellac, by the Haeuser Shellac Company, Inc., Brooklyn, N.Y., by vacuum drying. Stokes Vacuum Shelf Dryers, together with Stokes Condensers and Vacuum Pumps, remove excess moisture from the finished product.

The drying operation, which formerly required 72 hours in open pan air drying, is now performed in just 6 hours in Stokes Vacuum Shelf Dryers. A definite moisture content is always obtained... a result seldom achieved by atmospheric drying.

Vacuum drying provides safe, rapid, economical, low temperature drying... without agitation... of a wide variety of delicate, heat- and oxidation-sensitive materials.

Determine quickly if your products can be improved by vacuum drying... by sending product samples to the Stokes Advisory Service... without obligation.



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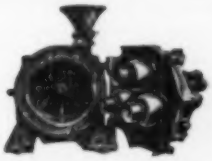
DUSTLESS BLENDER

Four-way mixing action assures a thoroughly blended product. Open-door accessibility permits easy cleaning. Available in many mixing capacities for ¼ ton per hour and up.



RING-ROLL MILLS

For medium and fine reduction (10 to 200 mesh), hard or soft materials. Very durable, small power. Operate in closed circuit with Screen or Air Separator. Open-door accessibility. Many sizes. No scrapers, plows, pushers, or shields.

SWING-SLEDGE MILLS

For coarse and medium reduction (1" to 20 mesh). Open-door accessibility. Soft, moderately hard, tough or fibrous substances. Built in several types and many sizes.

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For coarse, intermediate and fine reduction of hard or soft substances. Heavy or light duty. Cam and Roller action. Special crushers for Ferro-alloys. Several types, many sizes.

Sturtevant equipment, such as illustrated, helps you overcome high labor and production costs by increasing output. In addition, their rugged construction assures long life with minimum maintenance. It will pay you to investigate these machines. Write for information.

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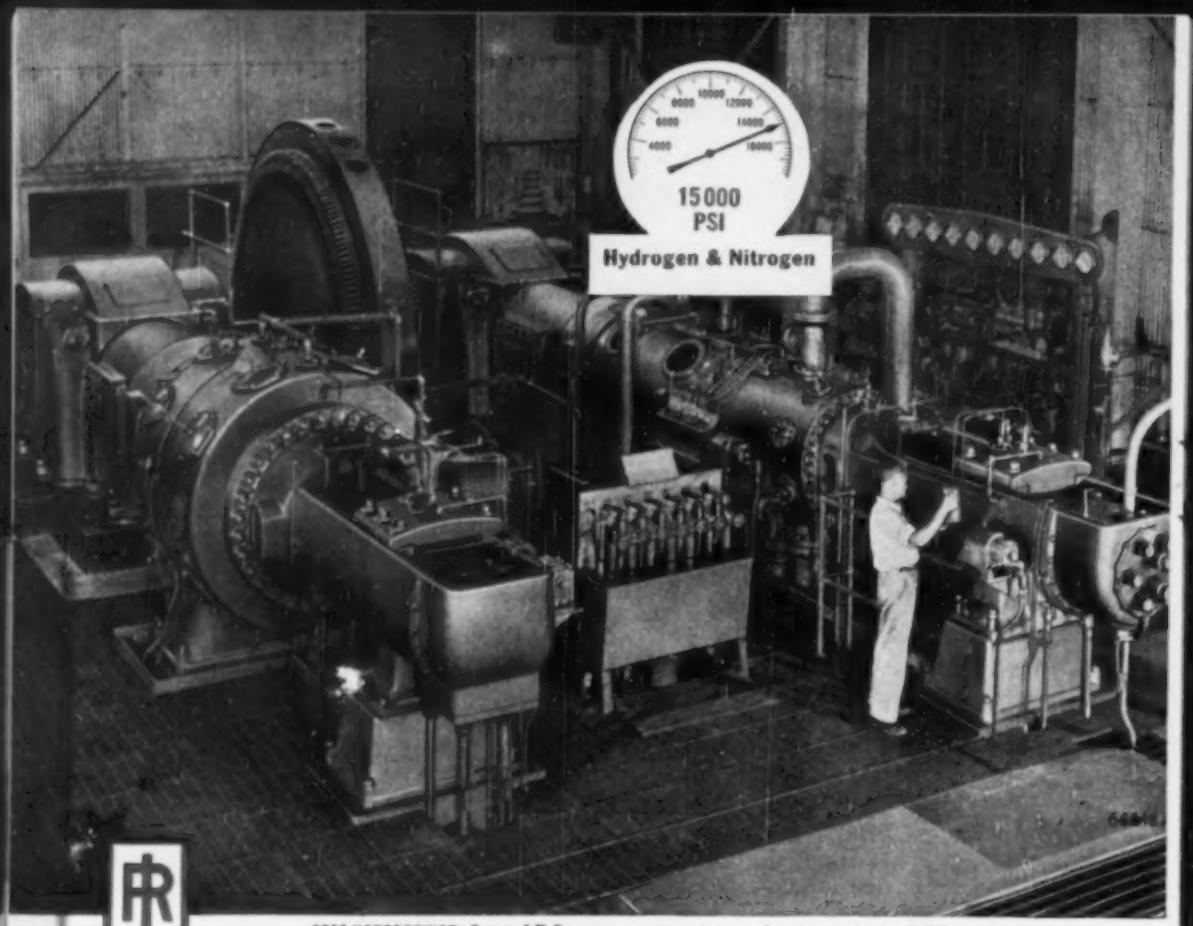
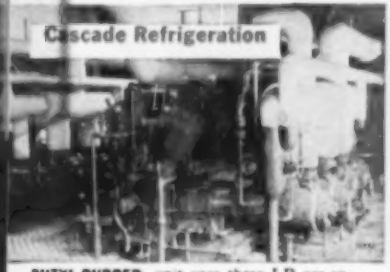
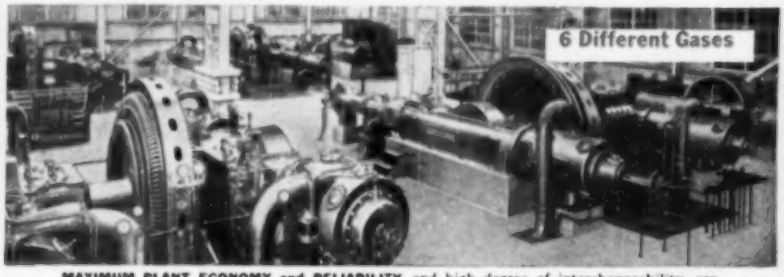


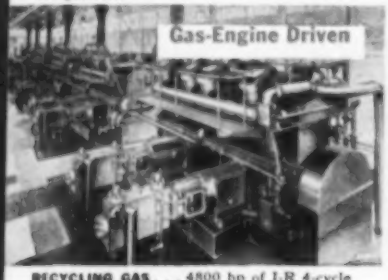
2500-HORSEPOWER 7-stage I-R Compressor... Its 4-ft. diameter cylinder inhales about a box-car full of gas every minute through a 20" intake pipe . . . after compression to 15,000 psi, the gas leaves through a 1" pipe . . . for manufacture of explosives and fertilizers.



BUTYL-RUBBER unit uses these I-R gas-engine-driven Compressors . . . seven being 300-hp ammonia and five 300-hp ethylene compressors.

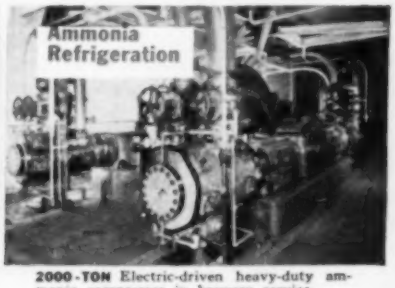


MAXIMUM PLANT ECONOMY and RELIABILITY and high degree of interchangeability, are attained even though each of these six I-R compressors handles a different gas and pressure condition in a chemical plant.



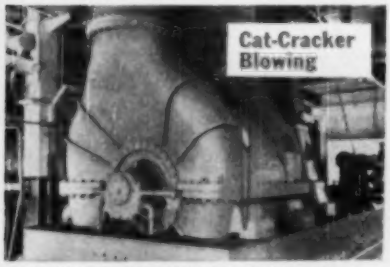
RECYCLING GAS . . . 4800 hp of I-R 4-cycle V-angle compressors . . . 1500 psi intake, 4100 psi discharge.

HYDROGEN compressors, 2500 psi, 4-stage . . . two 150-hp I-R units . . . non-lubricated pistons with graphitic-carbon wearing and pressure rings.

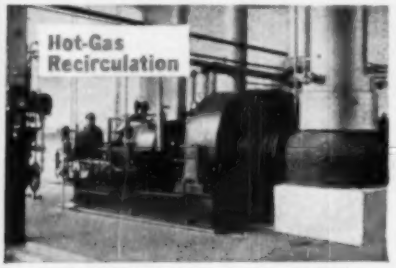


2000-TON Electric-driven heavy-duty ammonia compressor in brewery service . . . (I-R also builds Steam-Jet Water-Vapor Refrigeration units).

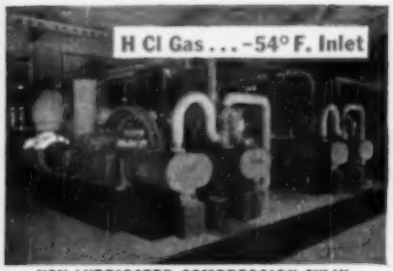
ELECTRIC-DRIVEN 200-hp heavy-duty vacuum pumps in glass-manufacturing plant . . . (I-R also has complete line of steam-jet ejectors and condensers).



5000-hp TURBO-BLOWER . . . turbine-driven I-R multi-stage unit compressing 57,600 cfm to 20 psi.



HYDROFORMING plant uses this I-R 1200-hp single-stage blower . . . up to 300 psi pressure . . . up to 800° F. inlet temperatures.



NON-LUBRICATED COMPRESSION CYLINDERS . . . Two steam-powered compressors in refinery service . . . 225 hp, 240 psia discharge.

12,500 HORSEPOWER TOTAL . . . five I-R 6-stage synchronous-motor-driven compressors handling nitrogen and hydrogen at 4500 psi.

Name your Gas,
Name your Pressure,
and your Service Conditions

Whatever the problem, you can depend on Ingersoll-Rand's 70 years of experience to meet your process compressor requirements . . .

more efficiently
more dependably
more economically

Pictured here are just a few of the thousands of Ingersoll-Rand process compressors and blowers that are on the job in practically every branch of the chemical, petroleum, and process industries. Every one of them is precision-built to the highest standards to do the particular job for which it was sold. This compressor experience means:

1. *No compressor problem is completely new* to Ingersoll-Rand. Details may differ, of course, but whatever your specific requirements, chances are Ingersoll-Rand has already built a process compressor, reciprocating or centrifugal, for a similar purpose.
2. *Dollar savings to you* in terms of sustained production, safety in operation, and low maintenance costs result from the years of design and manufacturing experience behind I-R compressors.

Our design and application engineers will be glad to help solve *your* compressor problems at any time. Simply get in touch with your nearest I-R representative.

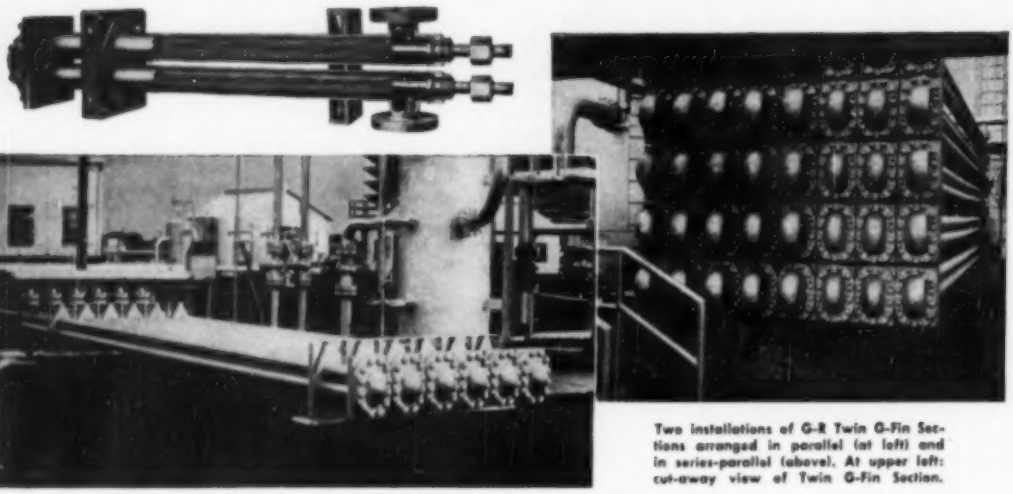
Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y. 462-1

Builder of Reciprocating and Centrifugal Compressors

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO BLOWERS • CONDENSERS
CENTRIFUGAL PUMPS • OIL AND GAS ENGINES

Compelling Reasons
Why You Should Investigate
G-R TWIN G-FIN SECTION



Two installations of G-R Twin G-Fin Sections arranged in parallel (at left) and in series-parallel (above). At upper left: cut-away view of Twin G-Fin Section.

If your plant requires a heater, cooler or heat exchanger, consider the record of the G-R Twin G-Fin Section. Here is a heat transfer apparatus that is:

SIMPLE . . . it consists essentially of one pipe within another, without the complications of tube sheets, baffles, or internal joints.

EFFECTIVE . . . the patented longitudinal G-Fins on the outside of the inner pipe provide an extended surface that compensates for the unequal heat transfer rates of dissimilar fluids such as oil and water or steam and process liquids.

ECONOMICAL . . . it is a stock design, easily installed, sturdily built for long life, requiring no attention, with negligible maintenance expense.

ADAPTABLE . . . units are standard and interchangeable, can be made of either ferrous or non-ferrous metals or alloys, can be used as a heater, cooler, condenser or heat exchanger for practically all liquids, vapors and gases, and can be readily converted from one service to another.

These advantages have been proven by installations totalling more than 50,000 units during the last 16 years, serving a greater variety of heat transfer requirements than any other design on the market. Most likely a G-R Twin G-Fin Section will improve one or more heat transfer operations in *your* plant. Write for Bulletin 1614 describing these units in detail.

50,000 INSTALLED UNITS
16 YEARS OF PROVEN PERFORMANCE
WIDEST ADAPTABILITY OF ANY HEAT EXCHANGER

THE GRISCOM-RUSSELL CO., 285 MADISON AVENUE, NEW YORK 17, N. Y.

GR-211

GRISCOM-RUSSELL

PIONEERS IN HEAT TRANSFER APPARATUS

CELANESE* CP ACETONE

Look to Celanese for CP Acetone—in the quantities you need to meet your industrial requirements. This high quality ketone is supplied in accordance with the following specifications:

Acetone Content	99.5% min.
Sp. Gr., 20/20°C.	0.7915—0.7935
Distillation Range	1°C. max. incl. 56.1°C.
Color	5 APHA max.
Acid as Acetic	.002% max.
Alkalinity as NH_3	1.0 ppm max.
Non-Volatile	Max. .001 gr. per 100 cc sample
Permanganate Time	2 hours min.
Aldehydes	None
Water	Less than 0.5% (miscible with 19 vol. 60° Be' gasoline at 20°C.)
Corrosion Test	Pass
Mercury Test	Pass

Celanese offers the advantages of a nationwide distribution system which includes tank truck delivery service in important areas. Write for catalog containing specifications and general information on Acetone as well as other Celanese organic chemicals.

CELANESE CORPORATION OF AMERICA
Chemical Division, Dept. 53-B
180 Madison Avenue, New York 16, N. Y.

GET THESE ORGANIC CHEMICALS FROM CELANESE

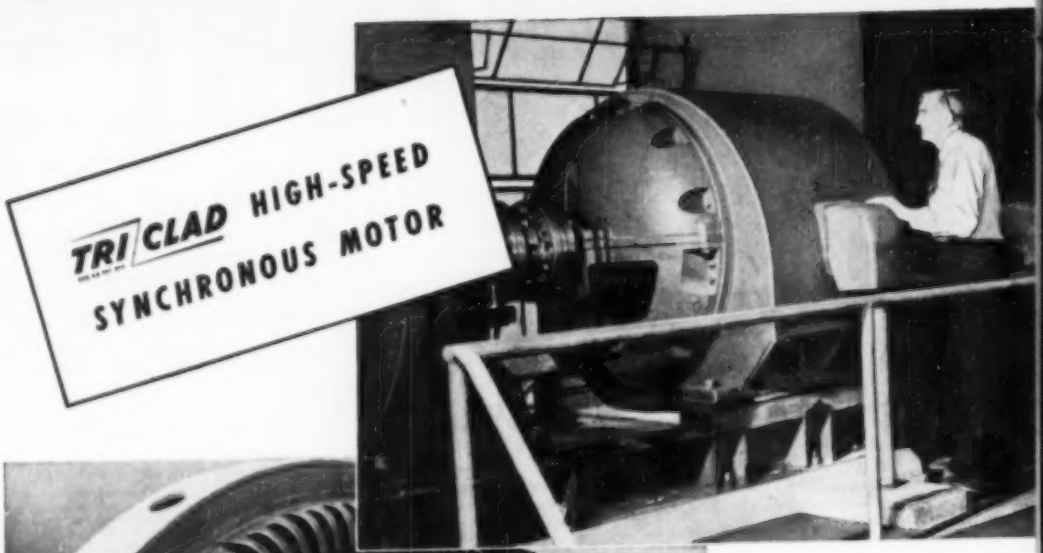
Formaldehyde	Propylene Glycol
Paraformaldehyde	Methanol
Acetaldehyde	n-Propyl Alcohol
Propionaldehyde	Butyl Alcohols
Acetic Acid	Tricresyl Phosphates
Acetone	Special Solvents

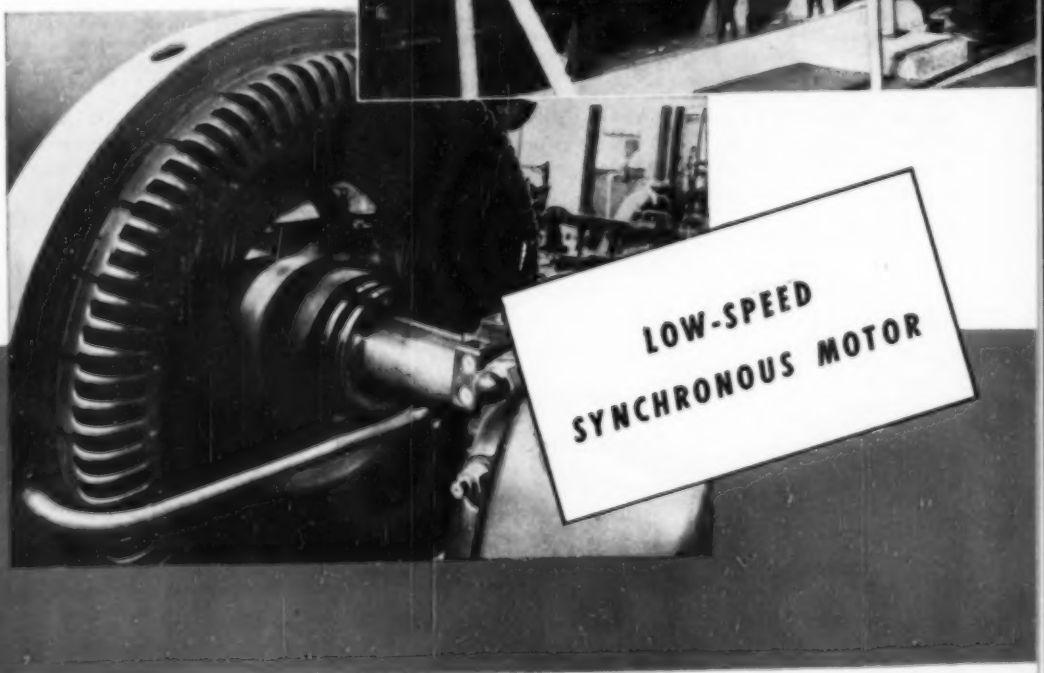
Celanese* CHEMICALS

*Reg. U. S. Pat. Off.

ACIDS • ALCOHOLS • ALDEHYDES • GLYCOLS • INTERMEDIATES • KETONES • PLASTICIZERS • SOLVENTS

SAVE on operating costs





USE GENERAL ELECTRIC SYNCHRONOUS MOTORS

SYNCHRONOUS MOTORS PAY THEIR OWN WAY

Yes, in certain applications a synchronous motor is cheaper to operate because it is more efficient than other electric motors.

Here's an example:

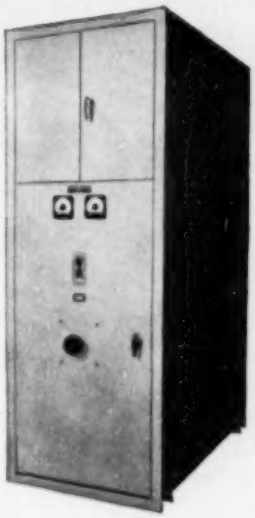
Compare a 200 hp, 2300 volt, 900 rpm synchronous motor with another type of motor of the same rating. Actual testing shows that the synchronous motor including its exciter loss is around 94% efficient while the other motor is about 92% efficient. The two per cent gain by the synchronous motor looks small but in this instance, where the motor operated sixteen hours a day, it meant a $200.00 annual saving in power costs, based on a $.01 per kwh power cost.

Your General Electric salesman can point out many applications where **synchronous motors have a lower initial cost** in addition to **lower operating cost.**

REMEMBER—Efficiency pays off in dollars and General Electric synchronous motors give you increased efficiency, in many instances at **lower first cost.**

Don't think of buying your next motor without seriously considering the application of **money-saving synchronous motors** in your plant. Call your G-E salesman right now, he has good news for you. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

G-E SYNCHRONOUS MOTOR CONTROL GUARDS EFFICIENCY



The new G-E synchronous motor control provides the accurate adjustments that enable you to improve power factor—increase efficiency. Here's where details count—where the slightest variation of a pointer on a meter means money saved—or lost. New meter design prevents any possibility of misreading the scale.

The new, smaller rheostat, too, has design features that not only result in longer life, but in greater operating convenience and accuracy. You can be sure, too, that the new field circuit will respond instantly to rheostat adjustment.

Steel cabinets not only protect personnel and equipment, but are designed to line up with other G-E power units such as switchgear, thereby improving plant appearance.

Ask your nearest G-E office for more information about this equipment that safeguards your investment . . . helps save on operating expenses.

GENERAL ELECTRIC

Apparatus Dept., Sec. H-770-8,
General Electric Company
1 River Road, Schenectady 5, N. Y.

Gentlemen: I would like more information on the advantages of synchronous motors. Please send me the indicated descriptive literature.

Low Speed	*High Speed*	*Control*
☐ GEA-529D	☐ GEA-5113	☐ GEC-505

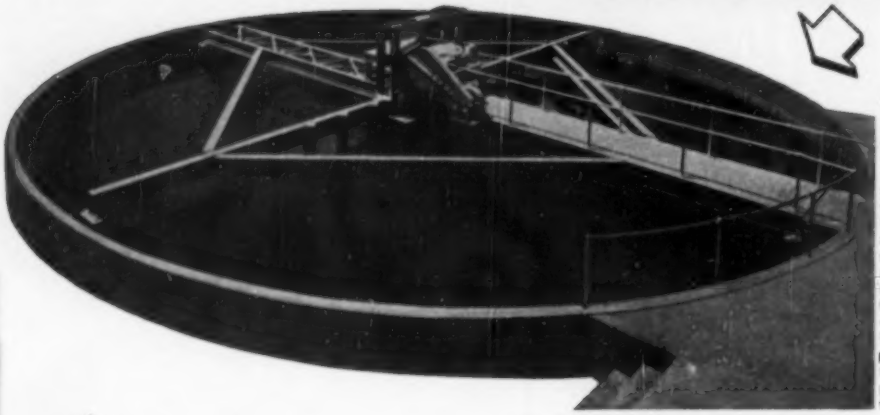
Name _____

Company _____

Street _____

City _____ **State** _____

Does your flowsheet require WATER PURIFICATION / BRINE PURIFICATION / WASTE TREATMENT *?*



The Dorrco Clariflocculator is a two-in-one unit providing mechanical flocculation coupled with continuous sedimentation and clarification . . . all in a single compact structure. In operation, solids are continuously withdrawn from a central sludge cone and a clear effluent is overflowed peripherally across a weir extending completely around the tank.

check the Dorrco Clariflocculator...

ADVANTAGES OVER OTHER UNITS:

- Maximum utilization of tank volume . . . due to central subsurface feeding, peripheral collection of overflow and controlled agitation during floc formation.
- Floc structure retained . . . by allowing mechanically coalesced solids to pass freely into the sedimentation zone, where they quickly settle.
- Ideal sedimentation conditions . . . produced by gradually decelerated flow along radial lines to a peripheral overflow weir of maximum length.

✓ FOR WATER PURIFICATION

Removes turbidity, color or hardness. Continuously produces a stable water . . . suitable for process use directly, or after sand filtration for removal of stray floc.

✓ FOR BRINE PURIFICATION

Removes both calcium and magnesium . . . reduces turbidity . . . delivers an effluent suitable for rapid sand filtration.

✓ FOR WASTE TREATMENT

Simplifies industrial waste disposal by removing suspended solids. Also may recover valuable constituents.

Write for detailed information, or better still . . . let us check your problem with you or your consulting engineer. The Clariflocculator may well be the solution.

DORRCO

THE DORR COMPANY, ENGINEERS
BARRY PLACE, STAMFORD, CONN.
NEW YORK • ATLANTA • TORONTO
CHICAGO • DENVER • LOS ANGELES
RESEARCH AND TESTING LABORATORIES
WESTPORT, CONN.
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PETREE & DORR DIVISION, STAMFORD, CONN.
ASSOCIATES AND REPRESENTATIVES
Dorr Technical Services and Equipment Are Also Available Through Associated Companies and Representatives in the Principal Cities of the World. Names and Addresses on Request.

DORR

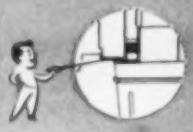
RESEARCH ENGINEERING EQUIPMENT

A JOY Axivane Fan in a commercial store—chosen for its low noise level, compactness, and simple and easy installation.
the JOY AXIVANE. FAN
Mounts Right in the Air Duct—
Saves space, installation costs, gives you quieter, more efficient ventilation!
Write for Bulletins, or
Consult a Joy Engineer
JOY MANUFACTURING COMPANY
GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.
IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

IN NO OTHER VALVE

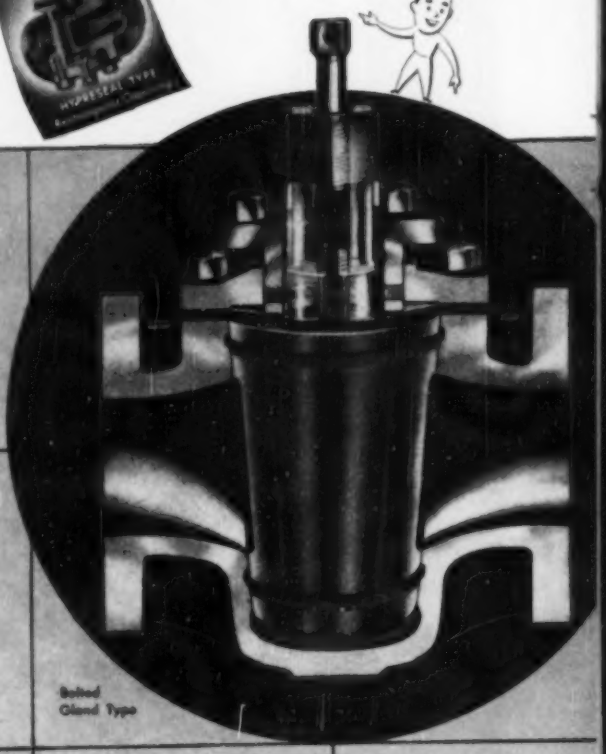
POSITIVE ROTARY ACTION

Tapered plug, fully lubricated



RESILIENT SHOULDER STEM SEAL

Allows jacking of plug



Bolted Gland Type

SMOOTH PASSAGEWAY

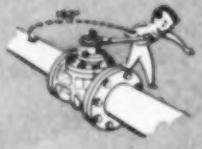
Streamlined, devoid of crevices

CAN BE "CRACKED" WITHOUT LUBRICANT LOSS

Lubricant will not blow out

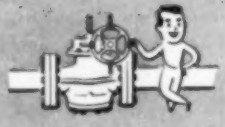
"SEALDPORT" SURROUNDS PORTS

Seals each port against leakage



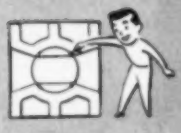
RENEWABLE SEAT WITHOUT REPLACEMENT

Plug can be re-positioned 180°



LEAST EFFORT TO OPERATE

Lubricant prevents galling



SEAT OF VALVE NEVER EXPOSED

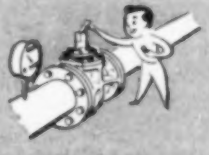
Line fluid does not contact seat

QUARTER-TURN

Simple sliding action

MOST COMPACT SIZES

Can be set in restricted space



RE-LUBRICATED UNDER PRESSURE

Ball check valve holds pressure

ADJUSTABLE UNDER ANY PRESSURE

No need to shut down line

So many features and every one IMPORTANT!

NO BY-PASS NECESSARY

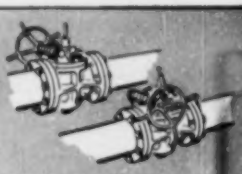
Safe with high differentials

CORROSION AND EROSION EFFECTIVELY RESISTED

Lubricant pressure protects parts

REPAIR PARTS AVERAGE ½ OF 1%

As compared with valve sales



VALVE SETTING IN OPTIONAL DIRECTIONS

Not restricted to one-way flow

A TIGHT SHUT-OFF ALWAYS

Lubricant pressure maintains seal

NO STEM BREAKAGE

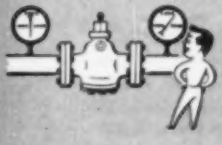
No excessive stress

FULL-FLOATING HYPRESEAL PLUG

Stem is independent of plug

FASTEST CLOSURE IN FRACTION OF USUAL TIME

Can be closed slow or fast



CAN BE OPERATED WITH ANY DIFFERENTIAL

No wedging force to overcome

INTERNAL LUBRICANT PRESSURE CAN BE GAUGED

Gauge can be directly installed

REPACKABLE UNDER ANY PRESSURE

Can be packed in any position

HYPERMATIC AUTOMATIC LUBRICATION SAVES TIME

Self-acting; self-feeding

Nordstrom Valves

NOW AUTOMATICALLY LUBRICATED WITH Hypermatic

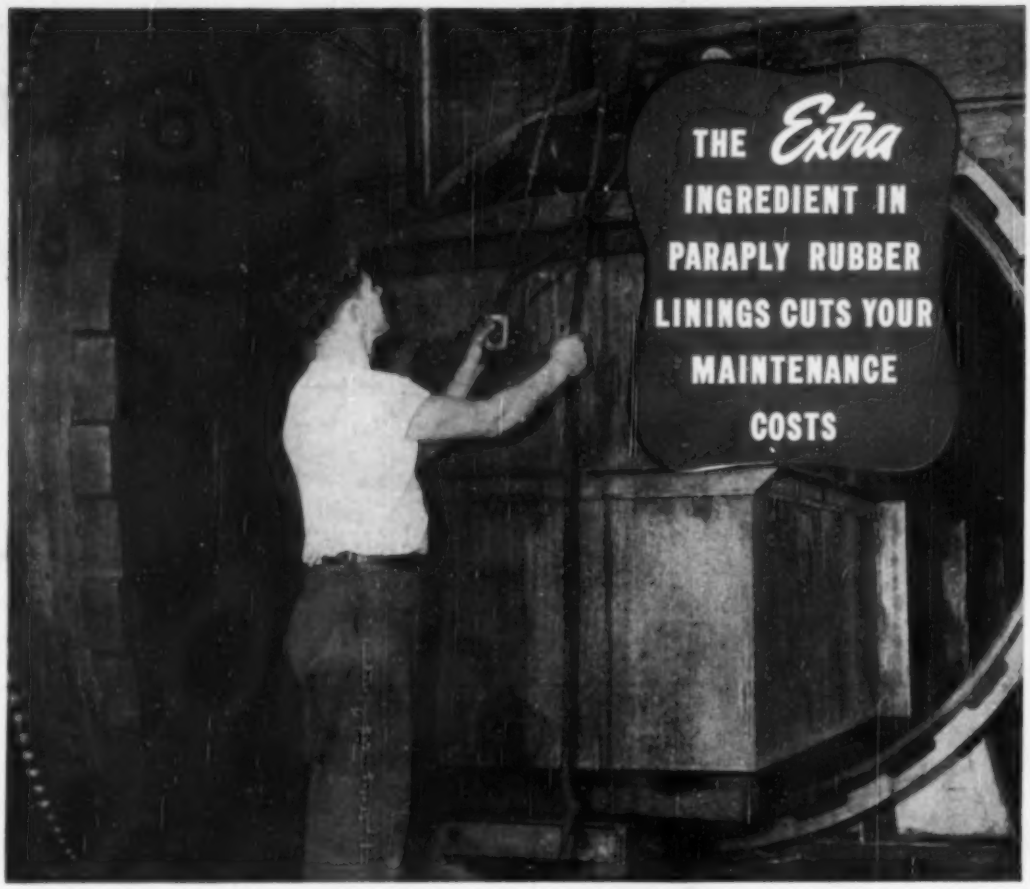
Pats. Applied for

Trade Mark

Nordstrom Valve Division—ROCKWELL MANUFACTURING CO.

400 North Lexington Avenue, Pittsburgh 8, Pa., Offices in all principal cities

Export — Rockwell Mfg. Co., International Division, Empire State Building, New York



THE extra ingredient we put into Paraply Rubber Linings is not a new magic chemical. It is old fashioned CARE. Extra precaution is taken in every step of manufacture to be sure you get more for your money than you expect.

This extra precaution starts with the choice of the proper rubber compound, developed specifically if necessary to meet your needs. It continues with the process of application, in such things, for example, as the use of a specialized adhesive which not only gives high bond strength, but provides corrosion protection as well. Thus any accidental rupture will be localized and easily repaired.

Final testing of the completed job is rigorous and thorough. Before any Paraply Rubber-lined equipment leaves our plant, high voltage current scans every inch to detect the slightest flaw.

This added ingredient, *extra care*, costs you no more. It helps you keep your maintenance costs at a minimum level, and is assurance of a useful life much longer than you could normally expect.

In addition to rubber, U. S. Stoneware manufactures a wide range of corrosion-resistant materials, including Tygon and Duralon plastics, Resilon synthetics, sheet and homogeneous lead linings and lead-lined products, chemical porcelain, chemical stoneware, acid brick, and acid and corrosion-proof cements, as well as baked-on and air dry protective coatings. We can thus recommend without prejudice the material or combination of materials that will do the best job for you.

U. S. STONEWARE

Since 1865 • Akron 9, Ohio

SPECIALISTS IN REDUCING PLANT MAINTENANCE COSTS THROUGH MORE EFFECTIVE MEANS OF CORROSION CONTROL

THE Chementator

Reg. U.S. Pat. Off.

COMMENTS ON THE NEWS OF CHEMICAL ENGINEERING IN INDUSTRY

Prepared under the editorial direction of Joseph A. O'Connor, News Editor

Carbide: into the lower acrylates

In a small commercial unit at its South Charleston, W. Va., plant Carbide & Carbon is now turning out drum lots of ethyl acrylate, first of the monomeric lower acrylate esters produced in quantity. Soon it will be joined by methyl acrylate. Carbide hopes to have both esters highballing out of South Charleston in tank cars before long. Others, available only in experimental quantities, on which development work is being pushed include the butyl, ethylbutyl and ethylhexyl acrylates.

A radically different process, on which complete patent coverage has been sought, is employed by Carbide to make these monomeric acrylate esters. Starting raw material for the synthesis of each ester is a pure olefin hydrocarbon.

The widespread possible uses for these acrylates tempted Carbide to get into their production. Not only can they be used to synthesize other organic compounds, but they themselves polymerize to yield resins for adhesives, plasticizers and viscosity index improvers. And the acrylates copolymerize with other active monomers. With styrene, vinylidene chloride and acrylonitrile, they form resins used in the wet-strengthening of paper, crush-proofing of textiles and finishing of leather. Ethyl acrylate copolymerizes with vinyl chloroethyl ether to yield a vulcanizable plastic for use in specialty rubbers.

It was, in fact, this market for ethyl acrylate in specialty rubbers that Carbide had its eye on when it decided to start producing this and the other esters. Bulk of Goodrich's Lactoprene rubber, for example, is ethyl acrylate. And vinyl chloroethyl ether, the other major ingredient, is now being made by Carbide, the sole producer, at South Charleston by a brand new process.

Other possibilities abound for the acrylates. The ethylhexyl acrylate copolymerizes with other monomers to produce internal plasticizers for vinyl resins. An acrylate coating gives a more flexible finish to leather than does a polyvinyl acetate emulsion coating. Another polymer may replace chicle in chewing gum. Polyacrylate latices, if available at comparable prices, might take the place of rubber latices in Scotch tape. About 15 percent ethyl acrylate in methyl methacrylate polymers increases their shock resistance.

The acrylates combine with alcohols, mercaptans and amines. With dienes, such as butadiene, they form cyclic esters. Chlorine, bromine and halogen acids can be added, thus introducing reactive groups. Beta-methyl mercaptopropionic acid, for use in pharmaceuticals, can be made from an acrylate by hydrolysis. Also, an acrylate is a raw material in the synthesis of a sulphur-containing amide, not unlike methionine.

All in all, this market for acrylate esters, which might reach upwards of 3 million pounds a year, has hitherto been overripe and largely untouched. Many applications await only a lower price. Already, Carbide has whittled 7c. or 8c. from the price of ethyl acrylate, which sells for 50c. a lb. in l.c.l. drum lots. As tonnage output of these esters climbs, prices will be pared and the market will inevitably expand.

RFC transfusion for McCarthy?

PATIENT—The organism that is the McCarthy enterprises needs more money pumped into its system. In need of this transfusion are McCarthy Center, Inc., which runs the Shamrock Hotel in Houston, McCarthy Oil & Gas Corp. and McCarthy Chemical Co., as well as Glenn H. McCarthy personally.

DONOR—To get the money, colorful oil man McCarthy has applied to the Houston office of the Reconstruction Finance Corp. for a loan. If the RFC grants the loan, it will be the biggest since the war to private business—a whopping $70 million.

However, the Houston office can make loans only up to about $100,000 without a go-ahead from Washington. So, after study in Houston, the loan application, together with recommendations, will have to be forwarded to Washington for action. RFC officials decline to disclose details of the loan application.

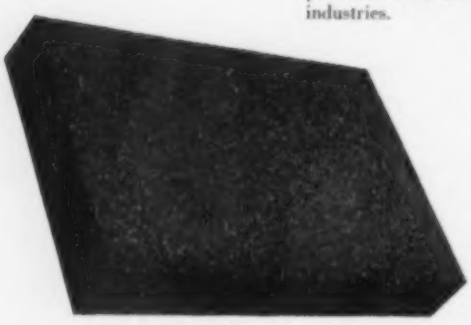
SYMPTOMS—While part of the money would doubtless be used to develop oil properties, some of it might go to pay off insurance loans on the plant of McCarthy Chemical at Winnie, Tex. The plant apparently has not been running as anticipated, and Stone & Webster has been called in to diagnose its troubles and see what can be done to improve its operation.

DOCTORS—Meanwhile, Senator J. William Fulbright, Arkansas Democrat, who heads the subcommittee on RFC of the Senate Banking & Currency Committee, was demanding full congressional investigation of these RFC transfusions for corporate patients.

(Continued on page 70)

WHY PC FOAMGLAS is the ideal insulation

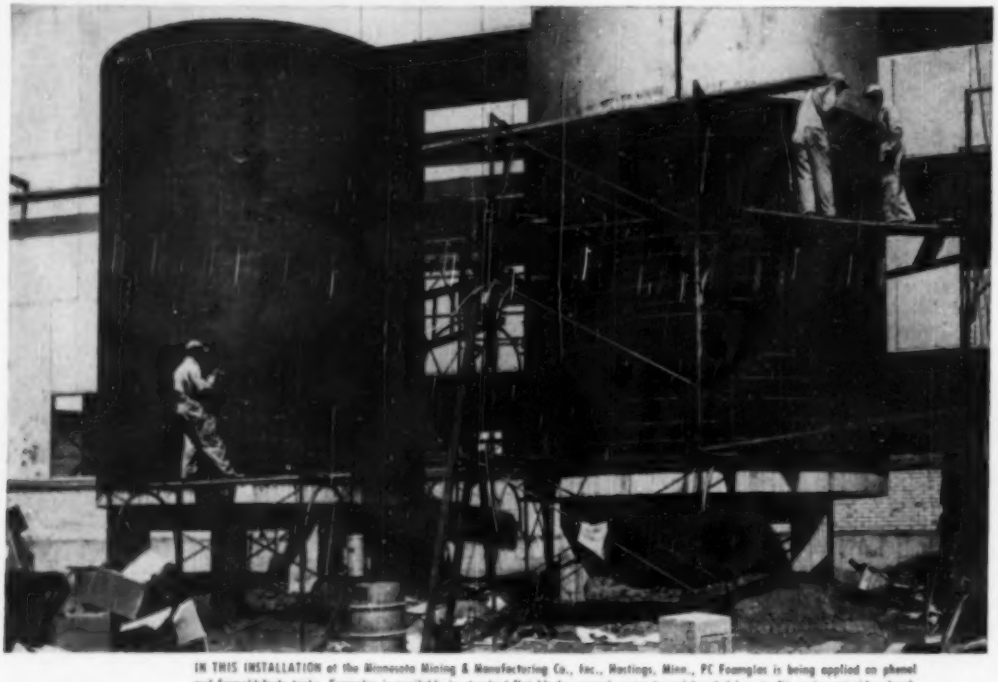
INDUSTRIAL plants throughout the country have come to rely on PC Foamglas to solve their most pressing insulating problems. They have found the unique properties of Foamglas make it the ideal insulating material for outdoor and indoor tanks, towers, retorts and other large vessels—for hot and cold piping, heat exchangers, evaporators and other processing equipment. Foamglas has especially proved itself in meeting the rigid requirements of the oil and gas, and chemical industries.



WHAT IS FOAMGLAS?

Foamglas is the only material of its kind, different from wools, boards and batts, the various fibrous and granular insulating materials with which you are already familiar. It contains no organic matter.

To make Foamglas, a very special kind of glass is subjected to a controlled heating process which produces strong, rigid blocks, composed of millions of tiny closed glass bubbles, full of still air. Because it is made of glass and because of its cellular structure, Foamglas is an exceptionally effective insulating material.

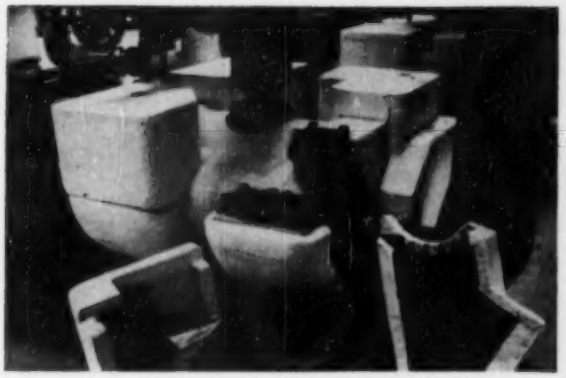


IN THIS INSTALLATION at the Minnesota Mining & Manufacturing Co., Inc., Hastings, Minn., PC Foamglas is being applied on phenol and formaldehyde tanks. Foamglas is available in standard flat blocks, curved segments and beveled lags to fit equipment sides, heads and domes, and in preformed sections for standard pipe sizes and fittings.

PITTSBURGH PC CORNING

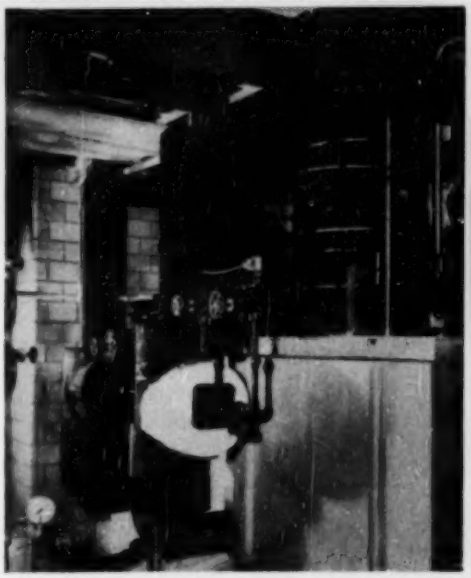
FOAMGLAS INSULATION

for industrial applications



◀ HERE, FITTING COVERS of PC Foamglas insulation have been fabricated in the field from standard blocks. The sections, covered with Marine paper, are interlocking, can be removed easily from the reciprocating pump when desired. Photo courtesy of Sinclair-Vacuum Oil Co., Inc.

▼ IN THE NEW antibiotic building of Parke, Davis & Company, Detroit, Michigan, PC Foamglas Pipe and Fitting Insulation has been used on the pipe lines. A finish will be applied over the insulation and painted to match the interior color scheme.



LIGHT — STRONG — WORKABLE

PC Foamglas is lightweight, easy to handle. Durable and strong, it requires no expensive vapor and weather protection. Foamglas can readily be cut with a knife in straight lines or odd shapes. And because it's friable, when subjected to point loading, it yields to such surface irregularities as rivet heads and welds. Thus it can be pressed close to the area to be insulated without breaking or cracking; it can be shaped to curved surfaces of all radii.

MOISTUREPROOF — ACIDPROOF — FIREPROOF

Its continuous cellular structure does not permit moisture or vapor to penetrate or pass through Foamglas. It withstands high humidity, minimizes condensation. And, since Foamglas is a true glass, it is acidproof and fireproof. The latter characteristic is especially valuable where Foamglas is used as insulation with materials which are not fire-resistant.

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You need fear no costly repairs, maintenance or replacements when you insulate with PC Foamglas. Being glass, it is impervious to many elements that cause other materials to lose insulating efficiency. In fact, when installed according to our specifications and recommendations, PC Foamglas retains its original insulating efficiency *permanently*.

Its ability to retard heat travel, to reduce condensation, to withstand humidity, makes Foamglas an exceptionally *effective* insulation. Freedom from repairs, maintenance and replacement makes PC Foamglas an exceptionally *economical* insulating material.

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Send for a sample of Foamglas. Test its light weight. Step on it. Cut it. Send the convenient coupon for our detailed, authoritative free booklet. Consult our insulating specialists regarding your insulating problems.

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When you insulate with Foamglas...you insulate for good!

Senator Fulbright was nettled by the $44 million loan to Kaiser-Frazer, the $12 million grant to Northwest Air Lines, the $6 million given to the Waltham Watch Co. and the $15.1 million loan to Texmass Petroleum Co. Earlier, he had questioned the wisdom of advancing added funds to Lustron Corp., now in default on $37.5 million of RFC loans.

One loan application that Senator Fulbright wanted studied in detail was the request of Glenn McCarthy for a postwar record $70 million from RFC.

Remington-Rand's option on GAF

When U. S. District Judge David A. Pine in Washington, D. C., refused last month to throw out the claim of Remington-Rand that it has an option to buy controlling interest in General Aniline & Film, he set the stage for the trial that started February 6.

Remington-Rand earlier had brought suit against I. G. Chemie of Switzerland, also known as Interhandel, contending it had a 1946 contract with Chemie officials to obtain the General Aniline stock for $25 million. It was a Chemie motion for dismissal of this contract suit that Judge Pine denied.

As a result of wartime seizure in February 1942 from I. G. Farben, the German dye trust, the U. S. Alien Property Custodian now holds a 93 percent stock interest in GAF. The Office of Alien Property would like to dispose of the stock, which, together with accrued dividends, is valued at $100 million.

But in 1948 I. G. Chemie, the Swiss outfit, sued the United States, claiming it was owner of the General Aniline stock and that it had been improperly seized as enemy property. The Alien Property Custodian charged that Chemie had acted as a "cloak" for Farben. The I. G. Chemie suit against the U. S. government has not yet come to trial.

Neither Chemie nor the Office of Alien Property wanted Remington-Rand in the picture. But, in effect, Judge Pine decided that there could be no settlement of the OAP-Chemie suit until it is determined whether Remington-Rand actually does have an option to buy the GAF stock if it is returned to Chemie. And the court ruled that this issue should be tried first.

Hence the trial that began this month. It may drag on. Meantime, everything else is at a standstill. No doubt the losing side will appeal when this decision is handed down, so that the disposal of GAF by Alien Property is delayed by legal snarls.

Strike threatens potash supply

INJUNCTION—U. S. District Judge Carl A. Hatch at Albuquerque, N. M., issued a temporary injunction on Tuesday, January 10, enjoining the CIO Mine, Mill & Smelter Workers from mass picketing and blockading entrances to the struck potash mines at Carlsbad (see *Chementator*, Jan. 1950, p. 72).

The injunction was sought by NLRB General Counsel Robert N. Denham after he issued an unfair labor practice complaint against the union. In the complaint, the union was accused of violating the section of the Taft-Hartley Act that makes it an unfair labor practice for a union to coerce and restrain employees in their right to participate or not participate in a union activity, such as the strike that began November 19.

Need for the injunction was hotly debated by Assistant NLRB General Counsel Winthrop A. Johns, the companies and the union. But in the end all sides consented to the temporary injunction.

This type of injunction continues until a decision is reached by NLRB on the unfair labor practice charges. This may take as long as a year. Hearings on the charges began February 14 at Carlsbad.

POTASH CRITICAL—The NLRB cited the critical impact of the strike as reason for needing the injunction. NLRB counsel argued that there was a critical shortage in available supplies of commercial fertilizers that might "seriously and adversely affect essential agricultural crops of the nation." Affidavits were submitted from the American Plant Food Council and the Department of Agriculture's Production & Marketing Administration.

Lewis G. Porter, fertilizer specialist, stated that 70 percent of the annual production of potash is consumed during the peak planting season, January 1 to April 15, and that 700,000 tons of potash will be needed during this period. Only half that much is available, he said. Even if the three companies resumed operations immediately and worked at capacity, he declared, it would be extremely unlikely that enough potash could be produced to meet the needs for the rest of the 1949-50 season.

The three companies, against whom Local 415 of the union has struck for a 25-c. wage increase, are Potash Co. of America, U. S. Potash Co. and International Minerals & Chemical Corp. Together, they produce 85 percent of the country's potash.

CONGRESS INTERVENES—A House agriculture subcommittee had asked Secretary Brannan to help end the strike. The request was sent by Rep. Thomas G. Abernethy, Mississippi Democrat, as chairman of a special fertilizer subcommittee of the House Agriculture Committee. The subcommittee said that, without the strike, some 1.1 million tons of potash would have been available this year, but it could not predict the situation if the strike continues.

STRIKERS ARRESTED—Ten union members arrested for contempt of court went on trial January 30. They were arrested January 7 after a federal court order was issued forbidding strikers to block railroad tracks between the potash pits and the refineries. Among those arrested were Chesley Smothermon,

(*Continued on page 72*)

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president of the local, and William Gately, international representative of the union.

SOME GO BACK—About 75 workers returned to their jobs on January 16 at the three struck potash plants at Carlsbad in a back-to-work movement. This is only a small percentage of the 1,600 members of the CIO Mine, Mill & Smelter Workers who struck November 19, but Rufus Poole, attorney for the companies, said it would permit the plants to attain 25 or 30 percent of normal production.

The workers rode into the plants in buses that passed through picket lines without incident.

Among charges made against the strikers by NLRB in obtaining the injunction was that they prevented buses and other vehicles from entering the mine property and also that they kept maintenance workers in the AFL International Brotherhood of Electrical Workers from going to work by mass picketing.

Citations for Celanese

Celanese has been cited by the National Safety Council for outstanding safety performances at its acetate yarn plant near Narrows, Va., and its plastics plant at Newark, N. J.

The Virginia plant established a record of 2 million man-hours of work without a disabling injury from Sept. 10, 1949, to Dec. 31, 1949, and the New Jersey plant was cited for its performance of 1 million man-hours of work without injury from the period June 3, 1949, to Jan. 9, 1950.

The record of butyl rubber

Butyl rubber, the synthetic rubber for inner tubes, is holding its own in a free market. Even before the mandatory controls on this synthetic were lifted in the fall of 1949, industry was using roughly three times as much butyl as the minimum required by law. This despite the fact that natural rubber has at times sold for less than the 18½-c. price of butyl fixed by the government.

Actual U. S. consumption of butyl in 1949 was an estimated 52,000 long tons, about 6,000 tons under 1948. From a total of 22 tons in 1942, U. S. consumption of butyl soared to an all-time high of 79,228 long tons in 1946. Since then, it has been tapering off.

Industry estimates 1950 requirement for butyl at about 50,000 tons.

Currently, butyl is being produced at a rate of about 4,000 tons a month. Low month was September 1949, when production dipped to 3,600 tons. Pipelines were filled and there was a temporary cutback in demand for all types of rubber. Since then, shipments of butyl are running at an annual rate of roughly 50,000 long tons.

The synthetic is made in two plants, both owned by the government but operated by private industry. Humble's Baytown, Tex., plant has a demonstrated capacity of 38,000 long tons a year. The other plant, run by Esso at Baton Rouge, La., has turned out as high as 42,000 tons a year. That makes an actual production capacity of 80,000 tons available. But for the first 11 months of 1949, the U. S. consumed only 46,986 tons of butyl rubber made in government plants.

Since the Baytown plant is one big unit, it is difficult to cut back production there. It has either to be kept running or shut down. So the government has ordered a second unit closed down at Baton Rouge, where Esso operates a total of three units. That leaves one unit at Baton Rouge still going. It has an actual capacity of about 14,000 tons a year. This, together with the output of the Baytown plant, more than suffices to meet the current demand.

A normal minimum inventory is a three months' supply, or about 12,000 tons at the current rate of production. Butyl stocks in both government and industry possession at the end of November totaled 12,339 long tons, compared with 10,995 tons at the end of 1948.

Cost up to now of development of butyl rubber is put at $11 million by Eger V. Murphree, president of Standard Oil Development Co. This excludes plant investment, since the government financed the butyl rubber plants.

Failure of butyl rubber inner tubes due to "cold buckling," caused by the slow rate of retraction, when stretched at low temperature, of the butyl rubber compounds formerly used, has now been eliminated by proper compounding. The intensive program that solved this problem was carried out by Standard Oil in cooperation with the rubber companies and with Polymer Corp., the Canadian government synthetic rubber company.

Butyl tubes have greater tear resistance and much better air retention than natural rubber inner tubes. At a time when people are driving harder, farther and faster, the butyl tubes give greater safety and better service for about the same price.

In 1948 and 1949, about 72 percent of the inner tubes made were of butyl rubber. More than 72 percent of the inner tubes made in 1950 will be of butyl.

For the first 11 months of 1949, shipments of replacement tubes for autos, trucks and buses were 29,944,667 units, down from 38,236,935 in the like period of 1948.

No butyl rubber goes into casings. However, the new cold rubber does. At San Antonio, Tex., Rubber Reserve has a fleet of vehicles with cold rubber casings under test. So far, tests seem to indicate that cold rubber casings lengthen tread life.

For the first 11 months of 1949, shipments of replacement casings for autos, trucks and buses were

(*Continued on page 74*)

As the white outline indicates, a standard unit of much greater frame size would be required to do the work of Speedaire.

Speedaire-equipped agitator built by Bufflovak Equipment Division, Blaw-Knox Company.

SPEEDAIRE agitator drive saves $267

HERE'S another equipment builder who uses Speedaire because it is compactly designed, lighter in weight and lower in cost. Compared to the conventional worm gear drive required to operate this steam jacketed vertical agitator, Speedaire offers these advantages:

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2. It weighs less than half as much,
3. It saves $267 per unit in cost.

Speedaire is Cleveland's fan-cooled worm-gear speed reducer. Because it is fan-cooled, Speedaire will do more work —will deliver up to *double the horsepower* of standard worm units of equal frame size, at usual motor speeds. It can be installed economically on many applications where other types have been used heretofore—giving you the advantage of a compact right-angle drive. Speedaire gives the same long, trouble-free service characteristic of all Clevelands.

For full description, send for Catalog 300. The Cleveland Worm & Gear Co., 3273 E. 80th St., Cleveland 4, Ohio.

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40,567,806 units, a decline from 46,195,543 in the corresponding period of 1948.

The American tire industry can expect a 5 percent increase in 1950 in passenger car replacement tire sales, John L. Collyer, president of B. F. Goodrich, predicts. Replacement of wornout tires on the millions of automobiles produced in 1946, 1947 and 1948 should be a major factor in this increase, according to Collyer.

Sales of replacement truck tires probably will exceed 7 million units, an increase of 4 percent, Collyer says, while 5 percent greater sales of replacement tires for farm use is anticipated in 1950.

Tire sales for 1950 are estimated at 80 million units, about equal to the 1949 total, by President Harry E. Humphreys, Jr., of U. S. Rubber. It is possible that original equipment business might fall off some, Humphreys thinks, but replacement sales should hold up well.

Right after the war, demand for replacement tires and inner tubes was abnormally high. What is happening today is that the demand is getting back to normal.

Packaged Fischer-Tropsch plants

Blaw-Knox is organizing to cash in on what it envisions as a coming business: the design and construction of fully integrated or packaged units for the synthesis of valuable chemicals from natural gas and possibly from other cheap fuels.

Work will be based initially on the Fischer-Tropsch synthetic fuels process and on related processes for making synthesis gas. In the Fischer-Tropsch process, any one of a number of raw materials can be used as a source for the intermediate feed material, synthesis gas.

Blaw-Knox has just completed agreements with Ruhrchemie and Lurgi for licenses and access to all process information developed by these German firms.

Ruhrchemie pioneered the development of the Fischer-Tropsch process, which was used in Germany to make gasoline from synthesis gas obtained from coal. Lurgi built plants of this type in Germany and also did work on coal gasification.

Blaw-Knox will adapt processes, develop pilot plants, design equipment, provide engineering and build plants for the conversion of abundant fuels into valuable hydrocarbons and other chemicals.

New synthetic fuels plant for Texas?

Pittsburgh Consolidation Coal Co. is reported to be considering purchase or construction of a plant in Texas to make synthetic gasoline from natural gas.

"We have been studying the possibilities of making gasoline from natural gas in Texas," says Pitt Consol's President George H. Love, "by much the same process as we would use to convert coal gas into gasoline."

This Texas venture looks more attractive to Love at present because there are huge reserves of cheap natural gas, which is allowed to flow freely without interference by national unions.

Pitt Consol has closed down the pilot plant in Library, Pa., which it operated jointly with Standard Oil Development Co. for over a year to explore the application of the fluidized solids technique to the gasification of coal and coke.

Now Pitt Consol is reported to have secured an option on one war surplus plant in Texas and to be in the market for a second.

West Coast glycol producer

Hancock Chemical Co. of Long Beach, Calif., is "very strongly considering" building an ethylene glycol plant in the Los Angeles Basin. The company has contracted with E. B. Badger & Sons Co. to draw up tentative plans.

Hancock's president, W. T. Hancock, however, refuses to commit himself, but says the plant will probably cost "more than $3 million to build." Engineers are designing a plant with a capacity of 60,000 lb. a day.

The plant may be in production by the end of 1950. If so, it will be the first on the West Coast to turn out ethylene glycol.

While he expects the price of ethylene glycol to dip, Hancock is not overlooking the fact that there is no West Coast competition—and only five glycol plants in the U. S.

More hexanol coming

While *n*-hexanol is not new, the straight-chain six-carbon alcohol has not always been too freely available on the market. However, Carbide & Carbon is due to be producing much larger quantities by early spring. Reason: Carbide is making *n*-hexanol at South Charleston, W. Va., by a new process.

Most of the alcohol will find its way to market. But there is also this angle to the expanded production: Carbide is at work on some new plasticizers that are based on *n*-hexanol.

Hooker expands at Tacoma

Capacity for production of caustic soda and liquid chlorine at its Tacoma, Wash., plant is being increased by Hooker Electrochemical. The company's engineers expect to have the work completed by October 1950.

Two circuits of old Type E electrolytic cells will be replaced by the newest Type S-3 cells, which have far greater capacity for producing caustic and chlorine. The Type S-3 cells are a recent development of Hooker research.

—*End*

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This anhydrous material has many of the desirable properties of red fuming nitric acid with additional favorable characteristics for certain uses. It is available in 55 gallon drums or tank cars. Further information may be obtained from any General Chemical office listed below.

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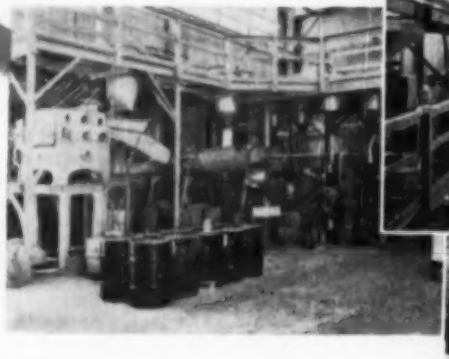

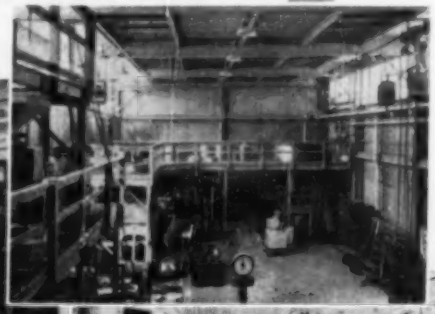

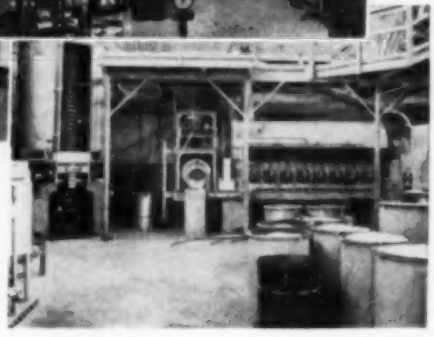

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Following are listed several types of projects on which Treadwell has recently been engaged:

- Engineering surveys and estimates for contemplated projects.
- Preliminary layouts, studies and reports for various types of industrial processing plants, for example, Treadwell has recently completed studies and complete layouts of all elements of an extensive ore dressing and processing plant.
- Layouts, design and complete detailing for construction of industrial installations, including equipment, buildings, structures, piping, instrumentation and electrical work. This usually includes complete specifications and in many cases purchasing of all materials.
- Design of equipment and operating units to suit special requirements.
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- Installations of boilers, turbines and auxiliary equipment.
- Design, fabrication and erection of tanks, stacks, breeching, ductwork, piping, structural steel work and bunkers.

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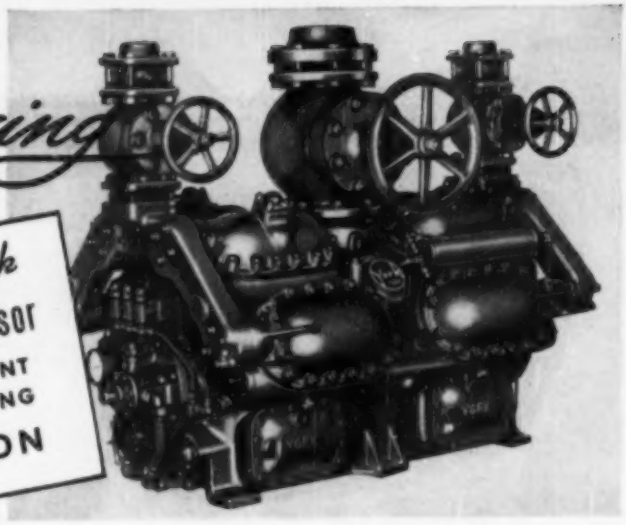

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2 LOW OPERATING COST. Greater speeds mean greater capacities. Flexibility of operation means lower power cost per unit of capacity. Partial capacity operation during partial load periods—with a range from 100% to about 25%—means an almost straight-line power saving!

3 LOW MAINTENANCE COST. Every part subject to wear can be readily, quickly and economically replaced with hand tools!

4 SPACE-SAVING COMPACTNESS. Multiple cylinders nested in "V W" formation, small bore and stroke, plus increased speeds, lend themselves to compact, space-saving design and construction. The new "V W's", in replacing old-style compressors, provide much more capacity in the same space. Costly engine room additions, or building alterations or expansions are not required.

5 SIMPLIFIED MOTORS & STARTING CONTROLS. Full, automatic unloading mechanism permits use of low torque motors, reduces current in-rush.

6 VIBRATION-FREE OPERATION. These compressors are in complete static and dynamic balance, permitting direct connection to driving motors. The result is smooth, vibration-free performance, permitting installation in remote areas . . . even on upper floors of existing buildings. Costly, heavy foundations and long, expensive refrigerant lines are eliminated.

7 FILTERED LUBRICATION. Disc-type oil filters effectively bar all dirt and abrasive matter. At the twist-of-the-wrist a filter-cleaner of turnable discs meshes tightly with filter discs, cleans all foreign matter—while machine is either operating or at rest.

8 POSITIVE LUBRICATION. An oil pump, directly connected to the crankshaft, force-feeds oil to every moving part—an unfailing supply, without chance of failure. An oil pressure gauge, and a unique, easy-to-read sight glass, permit simple, sure oil level check.

9 POSITIVE SHAFT SEAL. York's twelve-year, performance-proved Balanseal keeps crankcase gas tight-sealed. Balanseal is packless, its dual diaphragms are oil-immersed to reduce friction to a small fraction. The space within the seal is automatically kept full of oil. Balanseal always remains gas-tight.

10 BOOSTER AND HIGH-STAGE OPERATION. York "V/W's" are equally adaptable for booster or high-stage operation, providing both type machines with fully interchangeable parts. Or, when need for booster operation is over, the "V/W" machines can be changed to standard compressor operation. Greater high-temperature capacity is available for peak-load demands, and full-time use of all machines is assured.

11 COMPLETE NEW LINE. The new 1950 York V/W Ammonia Compressors are available in 4, 6, 8, 12 and 16 cylinder models. A wide, varied range with built-in flexible capacities that make them universal in application.

ATTENTION!

The new 1950 York V/W Ammonia Compressor has built-in capacities to match every industrial need, and is designed for operation with any type of prime mover—including steam turbine drive, permitting use of low pressure or waste steam. Check with your nearest York office for all the facts—and be sure to arrange to see York's new 30-minute film, *"York Offers Its Complete New Line of V/W Ammonia Compressors."*

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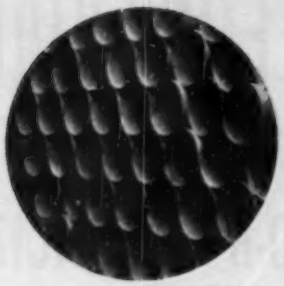

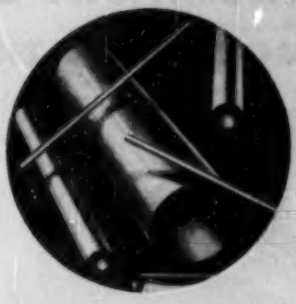

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Whatever your tubing requirements . . . pressure tubing, stock line tubing, cooling coils . . . TRY TRENTWELD! Trent Tube Company specializes in the production of stainless and high alloy tubing. All mill facilities are designed to produce tubing that offers rugged dependability, long life and economical service. These features coupled with the many advantages of stainless steel tubing make TRENTWELD ideally suited for use in your application.

You're assured of quality because TRENTWELD is made in a tube mill by tube engineers. You're assured of proper application, because as tube specialists, Trent can show you how to apply TRENTWELD to your application . . . better! You're assured of finding what you need, because the complete TRENTWELD line ranges from ⅛" to 30" diameter inclusive. You're assured of prompt delivery, because Trent's mid-continent location makes every industrial area easily accessible by train, plane, boat or truck.

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FORMULATIONS OF VINYL SHEETING STOCKS DEMONSTRATE THE SUPERIOR PERFORMANCE OF

"ELASTEX" 50-B PLASTICIZER AND "ELASTEX" DCHP PLASTICIZER

Barrett

Typical formulations incorporating either Barrett "ELASTEX" 50-B Plasticizer or Barrett "ELASTEX" DCHP Plasticizer in the preparation of polyvinyl chloride sheeting stocks show the outstanding properties of these stocks in the usual tests of compatibility, permanence and plasticizing efficiency.

1. COMPATIBILITY. The high compatibility of "ELASTEX" 50-B Plasticizer permits its use with other less compatible plasticizers thereby effecting reductions in the cost of the compounds.

2. PERMANENCE. Use of "ELASTEX" 50-B Plasticizer and "ELASTEX" DCHP Plasticizer improves oil- and water-resistant properties of stocks, even when more easily extractable plasticizers are incorporated in the formulations. Low volatile losses and excellent light stability qualities are also noteworthy when "ELASTEX" DCHP Plasticizer is included in stocks.

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For complete information and test data reporting experience with five compounds, send for the pamphlet: *Applications for "ELASTEX" 50-B Plasticizer and "ELASTEX" DCHP Plasticizer in Vinyl Sheeting Stocks.* It will be sent you without cost or obligation.

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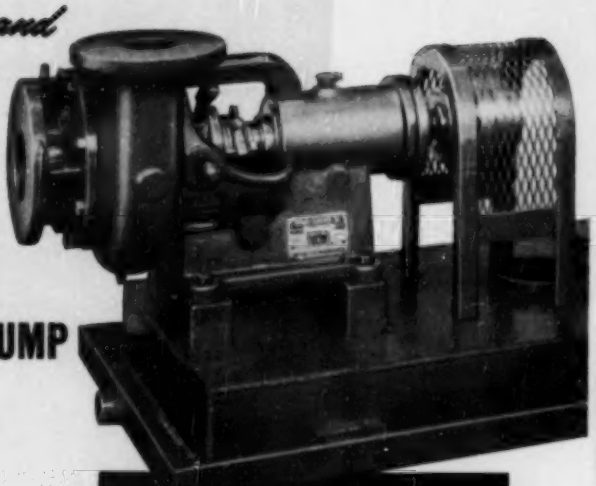
It's ruggedly built... and moderately priced!

PUT THIS WELL ENGINEERED GENERAL PURPOSE PUMP TO WORK FOR YOU



BJ FIGURE 1025
GENERAL PURPOSE PUMP

THE BJ FIGURE 1025—a horizontal, single-stage, end suction centrifugal pump — is a sound recommendation for general purpose pumping in your plant. Incorporating BJ *engineered* advantages and ruggedly built to give long, dependable service, it is also priced favorably. Take a look at these design, construction and capacity specifications:

CONSTRUCTION: Standard construction is cast iron with bronze fittings. It can also be supplied in all iron construction or in corrosion-resistant or other special materials as desired.

BALL BEARING BRACKET: Pump case is securely bolted to a compact rigid bearing bracket. Two oil lubricated single-row ball bearings support shaft without deflection.

STANDARD STUFFINGBOX: The standard stuffingbox has more than the usual number of packing rings generally found in this class of pump. It provides 9 in the standard unit or 7 when cage ring is supplied. A water-jacketed stuffingbox is also available at additional cost.

NEW BJ MECHANICAL SEAL: The Figure 1025 may be secured with the new BJ Mechanical Seal which replaces the standard packing in the stuffingbox. This mechanical seal protection is recommended for uses where extra demands are made on stuffingbox performance and where positive protection against contamination of pumped liquid is a factor.

GENERAL SPECIFICATIONS

Pump Sizes	1¼, 1½, 2, 2½ and 3* inches
Capacity Range	10-600 gpm
Head Range	20-340 ft.
Temperature Limit	350° F.

*Double volute case on this size.

Find out how the BJ Figure 1025 Pump – either with standard stuffingbox and packing, or with BJ's new mechanical seal–can handle your general purpose pumping with moderate first cost and low operating cost. Send coupon below for full details.

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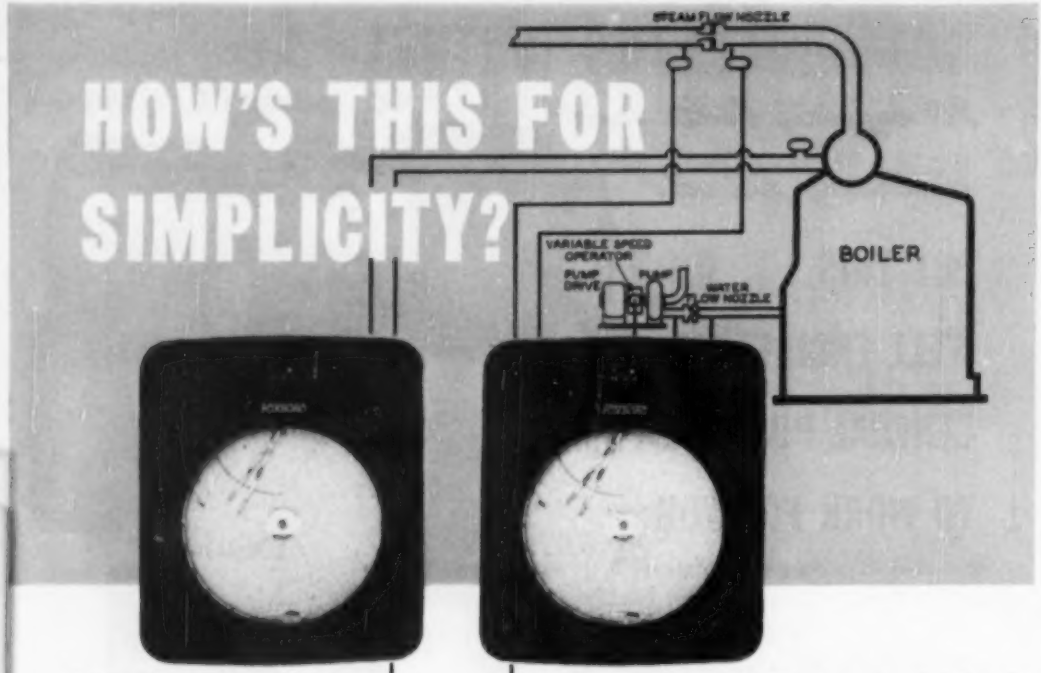

M-40 Recording Liquid Level Controller

M-40 Recording Steam Flow/Water Flow Pneumaticset Ratio Controller

3-Element Control for Boiler Feed Water with ONLY 2 INSTRUMENTS... NO AVERAGING RELAYS

Here's an opportunity to simplify boiler feed water control . . . and make it more dependable too. With this Foxboro system on a boiler of high steaming rate and low drum capacity, you get all the advantages of 3-element control, *plus* ratio-setting automatically adjusted by boiler water level. Ratio setting is undisturbed by the temporary effect of "swell" or "shrink" caused by sudden load changes.

This new standard of simplicity and dependability in boiler feed water control is made possible by two Foxboro Instruments, the M-40 Recording Steam Flow/Water Flow Pneumaticset Ratio Controller and the M-40 Recording Level Controller. The flexibility of Pneumaticset is outstanding . . . making the following combinations available almost instantly: (a) full automatic—steam flow/water flow ratio controlled, with ratio set by level; (b) semi-automatic—steam flow/water flow ratio controlled, with ratio set by hand; (c) remote manual—feed water valve manually positioned from instrument.

Engineering data are available to help you check and compare this system. Write **The Foxboro Company, 16 Neponset Avenue, Foxboro, Mass., U. S. A.**

THESE M-40 FEATURES INSURE UNUSUAL RELIABILITY

1. Unmatched ease and stability of adjustment **2.** Emergency-proofed—instrument can be dismounted without disturbing manual control panel **3.** Self-aligning ball linkage—pinch clip for easy removal **4.** Main and sub-assemblies interchangeable with those of other M-40 Controllers **5.** Precision-built, inside and out **6.** Proportional band setting, 0 to 200, either direct or reverse action made by turn of dial **7.** Wide range variable reset resistance, 0.1 to 50 minutes, without use of needle valves or lengths of capillary tubing

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Supplying chemicals to American industry means more than meeting specifications at a price.

With Solvay . . . it means prompt, *dependable* delivery from coast-to-coast warehouse stocks . . . a continuing supply from five big plants situated in America's industrial centers.

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These "extras"—"extras" that cannot be shown in a specification, or found on a price list—are yours at no extra cost when you deal with America's leading manufacturer of alkalies. Next time you order alkalies and associated chemicals . . . specify Solvay.

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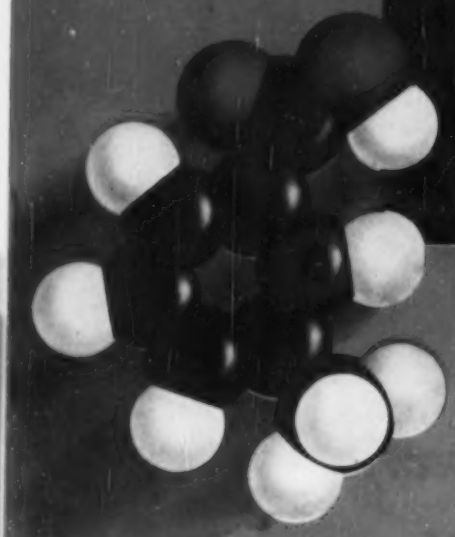
ANNOUNCING! A NEW DEVELOPMENT FROM
ORONITE'S RESEARCH LABORATORIES

toluic acid



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IN RESEARCH QUANTITIES

Oronite Toluic Acid consists predominantly of meta and para toluic acids in the ratio of approximately 2:1 together with minor amounts of the ortho isomer. It is a light-colored crystalline solid having a total toluic acid content of approximately 95%. This chemical and its derivatives are suggested for a wide variety of uses:

1—as a modifier of alkyd resins it increases hardness of both drying and non-drying types and also permits processing of short oil alkyds to a low acid number without gelation.

2—as a raw material for the production of plasticizers through esterification with suitable alcohols.

3—as preservatives and fungicides. The alkali salts are of interest as preservatives and rust inhibitors and the heavy metal salts may be fungicidal.

4—as an intermediate for the production of resins by the polymerization or copolymerization of the vinyl or other unsaturated esters.

Oronite Toluic Acid offers to the chemical industry a potentially low-cost raw material for chemical synthesis and for use in alkyd resin formulations.

Ten more new Oronite products available now in research or pilot plant quantities:

1. Quaternary Compound ATM-50 (a cationic surface active agent).
2. Alkylphenols (with side chains averaging C_{10} and C_{14}).
3. Bibenzyldicarboxylic Acid (mixed isomers).
4. Olefins No. 20 (a mixture of monoolefins averaging approximately C_{16}).
5. *p,p'*-Stilbenedicarboxylic Acid.
6. Nitrogen Bases (a mixture of pyridine and quinoline homologs).
7. *m*-Xylene.
8. Durene (1, 2, 4, 5-tetramethylbenzene).
9. Pseudocumene (1, 2, 4-trimethylbenzene).
10. Alkyl Mercaptans (*n*-propyl, isopropyl and *sec*-butyl).

Information on any of these products is obtainable on request.

ORONITE CHEMICAL COMPANY

Product Development Department
ORONITE CHEMICAL COMPANY
200 SANSOME STREET, SAN FRANCISCO 4, CALIF.
30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

Memo from the Editors

For the 27th Time

Back in January 1924, *Chemical Engineering* (then *Chem. & Met.*) started something that was described as "practically a pioneer effort in a field that is deserving of intensive exploitation": an annual statistical issue to bring together quantitative data on the consumption of industrial chemicals. The situation was then so bad that economists, it was said, were "often dumbfounded by the striking paucity of statistical information."

Every year since, we have carried out our 1924 promise to publish a statistical review-and-forecast issue. For many years of this period, our estimates were one of the few sources of quantitative data on the distribution or "end-uses" of industrial chemicals. In September 1937, and again in 1939, we brought out our special numbers on "Facts and Figures of the American Chemical Industry." Naturally, in time, more figures became available from government and other sources. This has been especially true since 1942. *Industrial & Engineering Chemistry* began its facts-and-figures series in 1948.

In this issue's report, our 27th in our unbroken series, we air several other facets—law, labor, know-how—in our many-facet industry. The reason is obvious: recent developments in these may well affect the industry and its stakeholders (every chemical engineer) for years to come. At the same time we are sticking to those objectives we've always sworn by: (1) original estimates based on first-hand information from the industry; (2) interpretation of trends.

Two of the prime movers in that pioneering idea of 26 years ago are still active in helping to put out these annual reviews. They are Sid Kirkpatrick, editor, and Henry Batters, now senior market editor. Although each report is really a staff effort, the job of organizing and directing this year's "statement to stakeholders" fell to Market Editor Dick Warren. And Dick has never hesitated to ask plenty from all of us, from our labor and legislation specialists in Washington, from our company representatives throughout the country, from the staff of the McGraw-Hill economics department and—most important — from our friends in industry and government.

Chementator Joe

There is no secret to the question we're asked so often: "Who turns out that 'Chementator' section of yours?" And since some 80 percent of you look at the section regularly, you deserve to know something about the editor who is largely responsible for it.

It is Joseph Aloysius O'Connor (from O'Conchobhair) who hails from County Essex (N. J.). Joe describes himself as a watered-down Irishman whose life has been dominated by three interests: reading, writing and chemistry.

Even as a kid, Joe was always dabbling with chemistry sets; he once set fire to his mother's curtains. He grabbed at all the chemistry courses offered in high school and at Seton Hall College, where he finished *magna cum laude* in 1942. He then took chemical engineering at Penn State. In the Army, where he put in a four-year stint, Joe was in CWS and later the Corps of Engineers. After a year as production supervisor at the Newark resin plant of U. S. Industrial Chemicals, Inc., Joe joined the staff of *Chemical Engineering* in 1947.

As a teen-ager, Joe began haunting the city rooms of the Newark newspapers. At Seton Hall he wrote regularly for the *Setonian*, became chief editor. He also edited the college yearbook and turned out press releases for the college. In the Army he wrote for post newspapers and for a while edited technical reports at the Engineer Board, big Army research center. Even at U.S.I. he wrote, contributing to "USItems." This didn't satisfy Joe's itch to write, so he tried his hand at short stories and verse. But now, as our news editor, Joe finally has the opportunity to write to his heart's content.

But Joe has plenty of other interests, too. His personal library bulges with books on practically everything—history, science, economics, politics, travel, philosophy, art. He has always been an avid and omnivorous reader, likes to browse in the literature of all ages. Joe has the Gaelic gift of gab and freely admits that, when really started, he belongs to the "breathless" school of conversationalists. His sense of humor has more than a vestige of the Irish free-and-easy imagination.

When it comes to digging out obscure facts behind a chemical development, Joe has the Gaelic tenacity to "bear it out ev'n to the edge of doom"—something often necessary to put out "The Chementator." And it is awe-inspiring to see how he will dig out, mull over, boil down and digest a few facts from yards of teletypes, telegrams, releases, letters, reports, memos and back-of-envelope scribblings—not to mention telephone and personal conversations—and crystallize them into a single hard-core "Chementator" paragraph.

Bits and Pieces

• Our hit article for November was Ed Fetter's "Line Tanks with Teflon." Our readership research indicates that over 90 percent of our subscribers found it valuable and interesting. But, oh how Ed did sweat for well over a month to get that scoop. It took him just as long to fully recover.

• In Latin (and geometry) QED stands for *quod erat demonstrandum*. To us it means Quotes, Extracts and Digests. (See Department-of-the-Month, p. 131.) This title was picked from a total of 253 dreamed up by the editors. It most concisely expresses our aim: "excerpts and abstracts from recent speeches of technical and/or general interest." QED.

• James Webb Young, in his *Technique for Producing Ideas*: ". . . the production of ideas is just as definite a process as the production of Fords."

Daily Steel Deliveries to the Chemical Industry

Wherever you are, Ryerson trucks are rolling your way every day . . . speeding shipments of the finest quality steel from nearby Ryerson stocks.

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This service cuts purchasing time because one call to Ryerson, one order and one invoice quickly covers a whole group of steel requirements. Do you want one piece or a truckload? You get prompt, personal service either way. Do you want your steel sheared, sawed or slit—burned, bent, punched or threaded? You can be sure of getting quick accurate delivery from your nearby Ryerson plant. So call us next time you need steel from stock. We'll get it to you faster because we're coming your way every day.

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ESTABLISHED 1902 SIDNEY D. KIRKPATRICK, Editor

Chemical Engineering

WITH CHEMICAL & METALLURGICAL ENGINEERING

FEBRUARY 1950

For Stakeholders in CPI

History, perverse as it sometimes is, warns us to beware when all the business forecasts point in the same direction. Our own economic advisers hailed the New Year's outburst of optimism as "a general epidemic of wisdom and foresight." But we who are stakeholders (if not all stockholders) in the chemical process industries feel we have good reason to be cheerful about the months ahead. We are part of an advancing sector of American industry. We are growing in many directions. Chemical engineering is constantly broadening the base of its operations. There is an ever greater backlog of new products, processes and plants to be developed and built on the accumulated results of research. And all along the line there is growing realization that future profits will depend primarily on our technological progress.

So this twenty-seventh in our series of annual reports on the facts and figures of the American chemical industry presents a realistic view of the economic and technical factors that are most likely to affect our future. It is presented in a new and challenging pattern. We hope you will find it interesting as well as useful.

The Final Court of Appeal

Lately, it seems to us, there has been a significant change in public opinion about business. Fewer people are willing to believe that the size of an industrial organization is prima facie evidence of guilt. More thoughtful students of our present economy are becoming convinced that powers in the hands of Big Labor and Big Government are much more serious threats to our wellbeing. Why this change? Part of the answer is to be found in the convincing way in which the A&P has carried its case directly to the public. Its hard-hitting advertising campaign has brought home in terms of food prices just what the action planned by the government's anti-trust suit may mean to the consumer's pocketbook. President Greenewalt and Chairman Carpenter of the Du Pont company have both been effective in using public forums to answer the attacks on the size and conduct of their business. Given a choice between a giant governmental organization in charge of all industry and the far smaller units of so-called big business, the American public is certain to take the part of private enterprise. Therefore, the lesson for all of us is to take the public into our confidence, to explain our policies, particularly as regards prices to the consumer and effects on his standards of living. Nor should we remain silent when under fire by political critics. Let us answer their charges with facts and figures that are understood by that final Court of Appeal—the American people.

Winner Pays All

Those who like to think of research as a gamble seldom talk about their losses. Yet as Eger V. Murphree remarked in his Perkin medal address, there are many large and costly projects that for one reason or another must fail. Hence a basic principal of industrial research, too often overlooked, is that "the successful projects must always pay for those that are not successful."

In illustration of how much it costs to get workable processes, Dr. Murphree pointed to three major projects initiated by the Standard Oil Development Co., of which he is president. Butyl rubber, which he described as a basically safer rubber for inner tubes, cost $11,000,000 for its research and development exclusive of production facilities. The fluid catalytic cracking process had cost $9,000,000 before the first commercial plant was built. To perfect the process for making toluene from petroleum entailed another $2,000,000 research program.

"Developments of the importance of those cited have been carried out by other companies in many fields. In most cases very substantial costs in research and development were involved before there was any assured commercial success. A company to go into such a development must have the money required and a faith in research. This would indicate that the bulk of new industrial developments of basic importance will result from the work of large organizations, al-

though important developments have and doubtless will continue to result from the research work of smaller firms and individuals."

Since such developments in our industries provide for ever higher rates of employment and increasing standards of living, we must not forget that the incentive for financing research comes from the expectation of profits from those that are successful. With Dr. Murphree we can all join in the hope that "we never see the day when, through restrictive legislation or other governmental action, this expectation ceases to exist."

Sell Chemical Performance

A new policy of chemical selling is developing, and with mutual benefit to producers and users. This is the effort to sell the properties and the performance of chemicals rather than merely the commodity itself.

In the case of new chemicals this is a natural, and often a necessary, technique. But it is also a good one to retain in the selling of old and established commodities. It furnishes a much safer and more effective basis for good relations between producers and users.

Something of the same philosophy is becoming a part of the trade literature of today. It is common to find in the advertising pages the suggestion that research quantities or "samples for trial" will be gladly furnished. Supporting such offers are quite often lists of the properties of the new or improved chemical. This enables everyone from plant superintendent to scientific researcher to judge as to the usefulness of the commodity in a new application.

There should be more of this. And the response to such offerings will be more cordial and effective as really informative technical statements of demonstrable performance are made available in news and technical articles, as well as in advertising and selling.

Accent on Age

What is going to happen when present and future pension plans are turning out millions of men from industry into unprepared and unproductive leisure? How will we compensate for this tremendous waste of manpower? Are we laying ourselves open for additional burdens of relief to care for dependents of those wage-earners who are forced to retire on inadequate pensions or who waste them in idleness and dissipation? Surely these are sociological problems which must have more serious study in the months and years ahead.

In the past we have heard much of the accent on youth and the study of the problems of child welfare, juvenile delinquency, and the health and education of the underprivileged. Is it not time to shift the emphasis to the uses that society can make of the services of those who have already arrived at or will soon reach the age of retirement?

A 55-year-old power engineer of our acquaintance has started a one-man campaign to interest his older Westchester neighbors in a teaching program for imparting the best of their business and professional experience to younger men in the community. He has helped organize local committees of retired businessmen who, working through the YMCA and other agencies, have almost completely solved the problem of placing World War II veterans in productive jobs. Other oldsters have been encouraged to help improve the local government by using their technical knowledge and experience in dealing with civic problems. What has been done on a small scale in this New York suburb could and should find broader application in other communities.

Chemical engineers and other professional men can provide needed leadership in organizing study of the many ways that older people can prepare themselves for more useful services to their fellow men. To quote again our friendly authority on geriatrics: "The seeds of destruction of the health of our nation are as much in the threat of possible mass idleness and indolence as they are in the misuse of atomic energy."

More Biochemical Engineering Needed

Development of new chemicals and the planning of new chemical processes now involve a number of the biological sciences. This has long been observed in the case of fungicides, insecticides, rodenticides and other chemicals concerned with pest control. Most evident is the need in the case of drugs and pharmaceuticals, and chemical components of proprietary chemicals. But even wider consideration of these problems is now necessary.

Scarcely any chemical can be put into customer establishments safely until its potential hazards to workers have been carefully appraised. Even when not generally toxic, such materials may develop dermatitis or other evidences of allergy in a small but significant number of the plant workers exposed. There are questions of skin contact, vapor inhalation, and other more subtle risks.

Larger chemical companies have for years been aware of some of these problems and have had biochemical and medical laboratories active in their service. The practice must be extended. Even the small companies which occasionally have these problems must be sure that they consult a competent advisor in either the field of toxicology or of medicine. On both legal and moral grounds we have a duty to our customers that must not be ignored. Anyone who doubts this can well listen to the rumblings from Washington as various official investigations proceed laboriously to study problems of this general sort.

STATE OF THE INDUSTRY

Our industry is far healthier than it has been for years. Supply and demand are close to equilibrium; prices are realistic. Profits are still good, albeit a bit spotty. Labor is more efficient and cooperative. The flow of new products and processes from research remains uninhibited.

CHEMICAL ENGINEERING'S 27th ANNUAL REVIEW

PROFIT AND LOSS

For some firms in the chemical process industries, 1949 will be remembered as the first red-ink year in almost a decade. Others showed profits up to 18 percent higher than for 1948. It was a better year for the chemical industry proper than for most of the process industries. Profits slid off some 20 percent for the process industries, but a number of leading chemical companies did not take the toboggan ride. The spotty—and at times violent—shakedown in prices naturally led to wide variations in profits. In general, chemical firms hardest hit were those in the alcohol, solvents, rayon, alkali and formaldehyde fields. At year's end, sales and profits were climbing back all along the line.

But there was a rosy side to 1949: stocks boomed and increased more than all industrials through the year. Investors were definitely optimistic. Gains were good—and often spectacular—in the chemical listings, more spotty for those of the process industries. Du Pont made news by its stock split, the only big one of the year.

Leaders in the industry, feeling that a prediction for the first six months of 1950 is not too rash, tell us that prospects are "good to excellent." They expect conditions for that six-month period to remain stabilized at about the levels of the last quarter of 1949. The second half of the year may see tougher going, they say, even though the odds now are against it. The reaction from Wall Street: "We're more optimistic."

SUPPLY AND DEMAND

For the chemical salesman, 1949 will go down as the year—the first in almost a decade—when he went out to sell again. It was a year of quickening competition, of a scrambling to hold customers through better service and products. Yet this is a condition, though sometimes painful, that is necessary to keep our industry alert and vigorous. All in all, it was a shakedown year in supply, demand and prices.

A few products of new and expanding use boomed and set records: synthetic resins, nylon and chlorine. Demand for others—fertilizers, rayon, soda ash, rubber—fell off to reflect unsettled business conditions. A few were in oversupply largely because of

some peculiar process or product competition: hydrochloric acid, caustic soda, methanol, some solvents. Others pretty well held their own: sulphuric acid, acetone, industrial alcohol (in spite of the most exciting price upset of the year).

The first half of 1950 will be more stabilized for most chemical products. Demand will be brisk—but supply won't have any trouble in meeting it. Materials going into the newer synthetic detergents, resin and fibers will go faster than run-of-the-mill commodities.

What about the second half of the year? The answer is not so clear. Which way chemicals go hinges largely on which way—and how fast—general business goes. And that depends on how much and which way the government spends, the cold war and the prospects for a hot one, weather and the Brannan plan, how labor behaves or misbehaves, world economic conditions, government's attitude toward business, how fast Western Europe continues to recover. Right now, the second half of 1950 looks fair-to-good.

MANPOWER

Two angles in our complex labor setup directed most of the jockeying that took place in 1949: (1) the game of wits between two men—John L. Lewis and Harry Truman—over Taft-Hartley, and (2) the prominence of the pension problem in collective bargaining. Several chemical firms initiated or broadened their pension plans. The strike front was relatively quiet. The most damaging strike was in the potash plants; it caused reverberations down the line of the fertilizer industry. Unsettled conditions in coal mining and steel cut back the supply of coal chemicals.

Employment in the chemical industry dipped sooner than for all industry—but bounced back sooner and stronger. Productivity of workers inched upward, but not as fast as wage rates. This gave incentive for engineers to scheme out more ways to mechanize operations. Safety news of the year: the explosives industry took first place as the "safest" of all chemical process industries.

This year has the earmarks of turning out to be a relatively quiet one on the labor front. Labor's pressure for more of everything will by no means let up, but it's not likely that many major disturbances will be started. For one thing, 1950 is a political period. The industry will have another year to live with the present Taft-Hartley setup; pension problems will be in the books throughout the year. There are few prospects for any new labor legislation of much industry-wide import.

PRODUCTS

The chemical process industries poured out a steady stream of new and improved products, processes and equipment; it was one of the most productive years yet. Most of these new and better things were the fruit of research done before and during the war. Some were adaptations of war-developed products and techniques. The year was noteworthy for the volume of top-notch developments in the fields of medicinals, resins and plastics, synthetic fibers, agricultural chemicals and synthetic organics. It was a year to be proud of.

It is likely that 1950 will turn out to be another banner year for new and better products; the industry has not yet reaped the full harvest from research started five or ten years ago. Higher costs and rising wage scales will also leave their mark on technology and products. More emphasis will be put on answering such questions as: How can we improve operations, processes and techniques so as to cut costs and increase productivity? How can we make our products from cheaper raw materials? How can we pare packaging, handling and transportation costs? Such dollar-sign motives stand behind many a major development.

But the best long-range insurance for a lustier industry is basic research—research today that will open up decades hence the unexpected new fields, new industries and new markets. Here are some of the fields that today's research promises to widen: synthetic fuels, medicinals, synthetic fibers, acetylene chemistry, organic fluorine chemistry, resins and plastics, agricultural chemicals.

PLANTS & PROCESSES

Last year the chemical industries chalked up a near-record for money spent on new plants and facilities—almost 10 percent as much as all industry (including mining, transportation and utilities). When business began to get shaky, how much did our industries cut back on capital expenditures? Not much; they still spent a little over 90 percent of what they were planning on when everything was rosy. Dollar-wise, the Southwest got the whoppers among the new plants. Most of them will turn out organics; petroleum or natural gas is the dominant raw material.

What does the industry plan to plunk out this year for capital expenditures? Some $1,040 million or about 5 percent less than during 1949 (industry as a whole will cut back 13 percent). Some of the big leaders plan to spend as much—or even more—than for last year. These plans seem firm; they may be revised upward if business is still going strong by September. Some 70 percent of the companies do not expect to cut back even if business drops 20 percent below its present level.

There are other healthy signs for 1950: (1) now that the pressure to expand is off a bit, management will see to it that any building program will be backed up by more critical economic and engineering studies, more thorough pilot and semi-commercial plant operation; (2) more competition among contractors and builders will give the industry better plants at a shaving in cost.

Most of 1950's big new plants will be in the organic field. Synthetic fibers—nylon, Orlon, Chemstrand, Dynel and others—will take a big part of the outlay. These fibers, in turn, will need attractive tonnages of a host of chemicals. The whole synthetic fiber program will spill well over into 1951 and 1952. And 1950 will also be a banner year for Oxo process plants. Only threat to a long-range expanding future for new organic processes: a dampening of the spirit of free enterprise.

PRICES

Last year's prices reflected—and in some cases exaggerated—the shift from a seller's to a buyer's market. *Chemical Engineering*'s price index skidded about 10 percent. Among those industrial chemicals that went down were alcohol (the term is mild for what happened to alcohol prices), acetone, butyl alcohol, organic solvents, some pigments (titanium dioxide held firm), phenol and salt cake. Some products, such as antibiotics and acrolein, were lowered in price as a result of improved processes or larger scale operations.

What was the net result? The price index of industrial chemicals lost its

1948 gains, ended up at about the 1947 level. Which isn't a bad level at all. Fats and oils had worse luck. After many ups and downs, they ended the year with a loss of about 35 percent. Now they are back pretty close to the OPA level. Which isn't a good level at all.

Confusion on what to do about basing point pricing added to industry's troubles. In some few lines it contributed to the inching up of delivered prices. It has put the distribution of some products into a regional pattern.

There will be few or no drastic price cuts this year—so chemical management tells us. Most industrial chemicals are expected to stay close to their present levels. Products of some of the process industries, such as fats and oils, may slide off another 5-10 percent. Competitive pricing is here to stay for a while.

LAW

Events of the past few years have made one trend clear-cut: the chemical industry—and industry in general—will be on the receiving end of more legislation that will affect their operations. This legislation will come from three levels: national, state and local. And as one executive put it: "Legislation aimed at business will affect our industry and, sooner or later, every person in it." That means every stakeholder in the chemical process industries.

Last year the government's big antitrust guns stepped up their blasts at such companies at Du Pont, Imperial Chemical Industries, General Electric and Remington Arms. The crux of the campaign seems to be narrowing down to these questions: Is bigness bad? How bad? How big is big? This is only the beginning; the argument will go on for years.

But 1949 saw a number of other legislative moves or trends that will carry over into 1950 and later. Among these were the subjects of stream pollution, water supply, smoke and smog, legalized freight cost absorption, the "chemicalization of foods," the use of herbicides and pesticides, a National Research Foundation. Control measures on some of these will be national in scope, others will be on the local level, a few will be both. This is a safe prediction: government — national, state and local—will attempt to put over more laws to direct, control and restrict our industry and its operations during the coming years.

PROFIT & LOSS

Selected Companies' 1949 Net Income

(Dollars, 000 Omitted)

	First Quarter	Second Quarter	Third Quarter
Abbott Laboratories	3,820	1,900	3,275
Air Reduction	1,817	1,524	1,560
American Cyanamid	3,647	2,780	3,408
Amer. Potash & Chem.	291	406	272
American Viscose	6,553	1,129	3,904
Bristol-Myers	897	709	562
Celanese	6,048	127	4,814
Cities Service	18,510	11,848	9,878
Colgate-Palmolive-Peet	3,580	2,000	3,612
Commercial Solvents	962	702	910
Continental Oil	10,835	9,530	8,301
Corn Products Ref.	3,904	2,386	4,726
Corning Glass	1,272	1,331	1,330
Dow Chemical	6,926	3,866	5,957
Du Pont	43,861	43,235	49,193
Duval Texas Sulphur	140	284	176
Eastman Kodak	11,739	9,060	13,261
Freeport Sulphur	1,286	1,371	1,409
Glidden	1,080	1,042	1,005
Hercules Powder	2,802	2,404	2,467
Heyden Chemical	565	313	396
Hooker Electrochemical	696	589	542
Industrial Rayon	2,777	2,409	1,607
Interchemical Corp.	473	263	573
Jefferson Lake Sulphur	119	76	233
Koppers	1,813	2,107	1,436
Lindsay Light & Chem.	76	95	95
Libby-Owens-Ford	3,596	5,210	6,103
Lion Oil	2,233	2,471	1,727
Liquid Carbonic	(182)	711	394
Mathieson Chemical	1,292	2,074	1,835
Minnesota Mining	3,216	3,118	3,612
Monsanto	4,402	3,526	3,806
National Distillers	5,633	3,350	4,529
Nopco Chemical	113	112	130
Parke Davis	3,080	2,165	3,404
Penick & Ford	444	304	737
Pennsylvania Salt Mfg.	540	715	904
Chas. Pfizer & Co.	2,537	2,029	1,589
Phillips Petroleum	12,713	9,240	10,733
Pittsburgh Coke & Chem.	527	505	627
Pittsburgh Plate Glass	7,814	7,757	10,291
Plymouth Oil	1,370	1,087	1,749
Publicker Industries	(401)	(469)	(616)
Rayonier	2,016	1,467	626
Rohm & Haas	902	1,238	1,304
Sharp & Dohme	1,370	1,081	1,480
Shell Union Oil	21,422	16,120	17,086
E. R. Squibb & Sons	1,066	1,707	1,444
Standard Oil Co. (N. J.)	75,000	63,100	58,100
Sterling Drug	4,334	4,635	3,631
Sun Chemical	224	397	347
Texas Gulf Sulphur	6,333	6,105	5,672
Union Carbide	34,530	17,507	34,308
U. S. Gypsum	5,212	5,014	5,774
U. S. Rubber	3,375	3,260	1,965
Victor Chemical	909	897	986

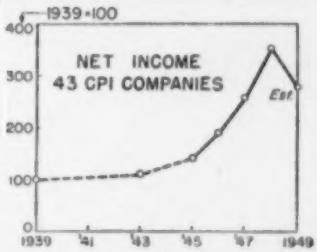
THE WORD

Some Saw Red

Financially, the year 1949 in the chemical process industries was good or bad, depending on where you sat. On the good side, earnings stayed up at a high level, dividend policies were more liberal with the end of postwar construction programs, construction costs ceased to soar, stock market prices boomed upward. On the bad side, profits were off more than 20 percent from 1948's record high. In itself this drop in profits sounds bad, but it is infinitely worse when you consider that some $1,100,000,000 of new chemical plant capacity came in during the year.

In reality, 1949 was the shake-down year. As the year began most chemical products had turned the corner into a buyer's market (*Chem. Eng.*, Feb. 1949) but the shake-down in prices was yet to come. It came during the year, with the net result that some companies saw red figures for the first time in years.

The general business recession in the second quarter had its effects on CPI profits, too, as did the steel and coal strikes. The unsettled labor situation meant a large number of strikes directly in the CPI. That had an impact on profits even more directly.



The strikes made the newspaper headlines, but the price drops in specific chemicals showed up more clearly in the earnings figures.

Low Spirits

The fantastic drop in ethyl alcohol prices had begun before 1949, but during that year the price hit bottom, bounced there a while, gradually rose a little. But the fermentation alcohol companies were the hard hit ones—those who make industrial alcohol, not the drinking kind. Publicker Industries showed a deficit for each of the first three quarters of 1949, and there seemed little likelihood that the fourth quarter would see the company out of the woods. U. S. Industrial Chemical, after a first quarter loss, was able to show only $86,000 profit in the second quarter on almost $10,-

000,000 of sales. In the third quarter USI's sales climbed slightly to $10.5 million, but profits was still only $273,000.

As long as the price of ethyl alcohol stayed down (and the synthetic producers gave no indication of much rise) profits could be expected to stay down.

Warped Woof

The textile industry was another that buckled in the second quarter, and rayon profits followed suit. Celanese saw sales drop from $47 million in the first quarter to $27 million in the second (in part this was due to formaldehyde, see below). Profits nosedived from $6 million in the first quarter to a measly $127,000 in the second. By the third quarter, Celanese had partly recovered with $44 million sales and $4.8 million net income.

American Viscose is another company which was hurt by the drop in rayon sales; but not so badly, because viscose rayon did not drop as badly as acetate. Sales in the first three quarters of 1949 were $52, $36, and $47 million respectively. The profit drop was more drastic, though—$6.6-million down to $1.1 million, then back to $3.8 million in the third quarter.

Unlike Celanese and Viscose, Rayonier did not recover in the third quarter. Each quarter of 1949 showed a steady drop in sales ($13, $11, and $10 million) and in profits ($2 million, $1.5 million, and $600 thousand). Industrial Rayon showed an identical pattern.

Among the textiles, one was outstanding—nylon. Despite increased plant capacity, Du Pont seemed no closer to the ever-increasing demand. This resulted in three things: (1) Du Pont's sales steadily increased during the year (nylon probably represents 15-20 percent of Du Pont's sales) and profits moved slowly up. (2) There was increasing talk about another company coming into the nylon field, getting licenses and know-how from Du Pont—following in the footsteps of sodium and cellophane. The big catch—the investment required would hit at least $50,000,000. (3) More and more companies jumped on the all-synthetic-fiber bandwagon, or were trying to. American Viscose and Monsanto teamed up on Chemstrand—reported to be hydrolyzed acrylonitrile-cellulose acetate copolymer—which is still in the pilot plant stage. It looked to the industry like Monsanto would supply the chemical know-how for polymerization, Viscose the experience in extrusion of the finished fiber. Carbide & Carbon continued to push Vinyon-N, including the staple form, rechristened Dynel. Industrial Rayon was still researching. Eyes were kept on Terylene, the British entry of Imperial Chemical Industries.

But Du Pont was not being left by the wayside. Its big Camden, S. C., plant will turn out Du Pont's second all-synthetic fiber late this year, the polyacrylonitrile fiber, orlon.

Selected CPI Companies' Stock Records—1949

Company	Dividends, Dollars/Share	Sales, Thousands of Shares	Dollars Per Share — High	Low	Year End	Net Change
Abbott Laboratories	1.60a	1,856	51	37	51	.....
Air Reduction	1.00	4,233	23¾	18⅝	22⅞	+ 4
Allied Chem. & Dye	11.00	1,175	210	155	208	+24
Amer. Agri. Chem.	3.00a	683	45	34⅛	44⅛	+ 9⅛
Amer. Cyanamid	2.00a	4,867	51¼	35⅜	50⅜	+12⅜
Amer. Viscose	4.00	2,649	74	49⅞	72½	+ 9⅜
Atlas Powder	2.50a	45	58	42	53¼	− 4⅞
Bristol-Myers	1.60	1,352	33	28⅝	28⅝	− 2⅝
Celanese	2.40	8,193	34⅝	23½	32½	+ 1⅝
Colgate-Palmolive-Peet	3.00	2,499	43½	29⅝	42⅜	+11⅜
Commercial Solvents	1.50	4,182	20⅜	13⅝	20⅜	+ 4½
Corn Products Ref.	3.60	2,363	73½	57	72	+13⅝
Corning Glass	.50a	2,149	30⅝	20	29⅝	+ 8⅞
Davison Chemical	1.50	844	22½	16⅝	22½	+ 3⅝
Dow Chemical	1.60a	4,855	57½	43	55½	+ 7
Du Pont	5.27	13,074	63¾	43¼	61⅝	.....
Eastman Kodak	1.70a	600	48¾	38⅝	46⅝	+ 2⅞
Ferro Enamel	1.40	701	17½	12⅜	17½	+ ⅝
Firestone	4.00	1,394	30½	23	28½	+ 5½
Food Machinery	1.00a	2,437	29⅞	20⅝	28½	+ 6⅝
Freeport Sulphur	5.00	760	60	38	80½	+16½
General Tire & Rubber	1.00a	973	21⅝	15⅛	19½	− 1⅝
Glidden Co.	1.60a	2,190	25⅝	17⅜	25⅛	+ 5⅛
Goodrich	4.00a	2,098	72½	52½	70	+11½
Goodyear	4.00	2,729	48¾	34	44⅝	+ 2⅝
Hercules Powder	2.60a	2,286	53	40	52¼	+ 6¾
Heyden Chemical	1.00	2,014	21½	14⅞	17	− 3⅝
Hooker Electrochemical	1.20	640	34½	24	33	+ 4
Industrial Rayon	3.00	1,302	53¼	33¼	52¼	+13¼
Interchemical Corp.	1.20a	1,073	18⅛	12⅝	18	+ 4
Int. Min. & Chem.	2.00	1,648	34⅝	24	34¼	+ 6⅝
Koppers	2.00	2,101	31⅝	23⅝	30	− ⅝
Libbey-Owens-Ford	5.75c	2,298	64	44⅞	62½	+16⅞
Lion Oil	1.80	8,135	33⅝	19	31½	.....
Liquid Carbonic	1.00	1,321	17⅞	13¼	17⅝	+ ⅜
Mathieson Chemical	2.13c	2,554	48	34⅛	47⅛	+ 8⅞
McKesson & Robbins	2.40a	1,280	41¼	30¼	41⅛	+10⅜
Merck & Co.	1.80	2,131	43⅝	27	42⅝	.....

Drugs on the Market

The antibiotics came into excess supply (particularly when new foreign plants cut into exports) and prices dropped. The net result was that some of the drug houses showed decreasing sales and profits.

At the year's end the alkali companies were wondering how they could keep sales and profits up. Productive capacity had increased and exports had dropped drastically—with the result that there was a glut of caustic.

Formaldehyde was another chemical that hit the rocks during 1949. It added to Celanese's drop in sales and profits. It showed up more clearly in Heyden's figures, where formaldehyde is a major sales item. Heyden saw its sales drop from $7.6 million in the first quarter to $6.2 million in the second, with no change in the third quarter. Net income dropped from $565,000 in the first quarter to $313,000 in the second, and $288,000 in the third.

Two other groups of companies were wondering about profits at year end—but for a different reason. They were the fertilizer companies and the potash companies. Potash output was down to rock bottom as the result of the Carlsbad strike (see *Labor*) and that meant a cut back on fertilizer production.

So, in essence the chemical process industries followed the rest of industry into a buyer's market, and the headaches that meant. It went, too, into the "recession," or "slump," or whatever else the economists chose to call it in the second quarter of 1949. But the CPI ended the year with profits and sales climbing back. How far they would climb was anybody's guess.

Stock Records, cont.

Company	Dividends Dollars/Share	Sales, Thousands of Shares	Dollars Per Share—High	Low	Year End	Net Change
Minn. Mining & Mfg.	2.60[a]	978	101	86¼	100	+32¾
Monsanto Chemical	2.00	2,944	87½	48⅝	80⅛	+ 9⅝
National Distillers	2.00	9,865	22⅞	17⅛	22⅞	+ 4⅝
Nopco Chemical	1.60[a]	360	30	21⅝	29	+ 5⅛
Norwich Pharmaceutical	.80[a]	47	14¼	11¾	14	+ 2⅝
Owens-Illinois Glass	3.00	2,116	64⅝	49¼	64⅝	+14½
Paraffine Companies	1.20	810	30½	13½	29¼	+ 1⅝
Parke Davis	1.40	3,672	38⅝	24½	37⅞	+13½
Penick & Ford	2.60[a]	402	37⅛	27⅝	36	+ 7⅝
Penn. Salt Mfg.	1.80[c]	486	45⅝	32	44½	+ 9½
Pfizer, Chas. & Co.	2.00[a]	133	67⅜	40¼	63⅜	+10⅜
Pittsburgh Coke & Chem.	.90[a]	946	14½	11	14	+ 2⅝
Pittsburgh Plate Glass	1.75[a]	3,489	37½	28⅛	37½	+ 5½
Proctor & Gamble	3.00[a]	2,350	86½	57½	85½	+30½
Publicker Industries	1.00[f]	2,403	22	14½	16⅝	− 2⅝
Rayonier	2.00	1,396	30½	21⅝	27	− 1
Rohm & Haas	1.00[a]	720	68½	38	68½	.....
St. Regis Paper	.60	8,898	9¼	6¼	8¼	− ⅝
Schenley Industries	2.00	7,733	31⅞	22⅝	31⅝	+ 3½
Sharp & Dohme	1.20[a]	2,827	38⅛	22⅝	38½	+15
Shell Oil	3.00[a]	3,528	40¼	30	37¼	− 1⅝
Squibb & Sons	1.25	900	37½	28⅝	35	+ 9⅜
Standard Oil Co. (N. J.)	4.00[a]	1,365	74½	60¼	66⅝	− 5⅜
Sterling Drug	2.00[a]	336	41½	35	37½	+ 1⅝
Sun Chemical	.40	1,390	9¼	6½	8¾	+ 2¼
Texas Co.	4.00[a]	6,321	68¼	48⅝	60⅛	+ 7
Texas Gulf Sulphur	5.00	1,973	70¼	50	59¼	+ 9⅛
Union Carbide	2.00	12,237	48⅛	33⅝	44⅝	+ 3½
United Carbon	2.00	1,428	38½	29⅜	38	− ⅛
U. S. Gypsum	4.00[a]	2,353	116⅜	69½	113⅝	+11⅜
U. S. Industrial Chem.	.....	831	26¾	17⅞	23½	+ 3⅝
U. S. Rubber	3.00[a]	4,065	43	31⅜	34⅜	− 1
Vick Chemical	1.20	1,086	23	20	22	+ 2
Victor Chemical	2.00[a]	564	47	33¼	45⅝	+ 9⅛
Va.-Car. Chemical	.....	2,227	11¾	8	7½	− 1½
Vulcan Corp.	2.00	319	33⅜	23½	32½	+ 6½
W. Va. Pulp & Paper	2.00	656	50¼	35¼	50¼	+10¾

[a] Also extra or extras. [b] Plus stock dividend. [f] Payable in stock, estimated cash value on ex-dividend date. [g] Declared in 1949. [k] Declared or paid after stock dividend or split up.

STOCK MARKET

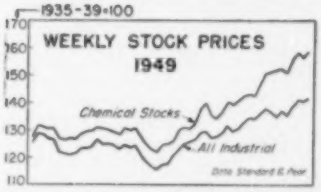
Decade of Opportunity

If CPI managements were worrying how far back profits would climb (above), the investors weren't. Ever since V-J Day, there had been prophesies of a "bull" market—but it had never materialized. Finally, as 1949 ended, it looked like the long-awaited bull market had arrived. And it was chemical process stocks, perhaps more than any group, that led the parade of rising prices.

As the year began, stock prices moved sluggishly within a narrow band. It was the same pattern that had been repeated so often since the end of the war. And chemical stock prices moved along with all the rest of the manufacturing company stocks (see chart). The pattern continued as the market reacted downward to the summer recession.

But then the pattern changed. Two things happened. First, stocks began to creep upward—all stocks. Second chemical stocks began to move up at a more rapid rate—began to outstrip the rise in all industrials.

By the end of the year, the chartists were sure a bull market had arrived. The N. Y. *Herald-Tribune* headlined "Bull Market in Full Swing as '50 Opens." Henry Luce decided that 1950 began "The Decade of Opportunity." At long last the stock market seemed to be catching up with current conditions.



The postwar years had been marked by one thing which the stock market had never seemed to realize—the relationship between earnings and stock prices was way out of line with historical values. One reason was that companies were no longer paying out most of their income in dividends. The tax structure, the shortage of equity capital, meant plowing back income to finance expansion programs. The net result was that the stock market seemed to deal more in dividend-to-price ratios than it did in traditional earnings-to-price ratios. But with 1949 most postwar expansion programs came to an end. Hence, the financial community could see a return to a dividend that would approach income.

So, the market rose.

There is no more telling way to point out this rise than the attached table of stock prices. There are 75 CPI companies listed, all carried on the N. Y. Stock Exchange. Four companies had major stock splits, so that their prices are not completely indicative of the rise (see Stock Splits below). One, Rohm & Haas, was new on the market. Of the 70 other companies, only 13 showed a drop for the year. Not only did 57 show a rise, 9 companies had the last sale of the year set a new high (Abbott Labs, Commercial Solvents, Davison, Ferro Enamel, Firestone, McKesson & Robbins, National Distillers, Owens-Illinois Glass, and West Virginia Pulp & Paper).

Some stocks zoomed amazingly. Minnesota Mining & Manufacturing, best known for Scotch tape, was up almost 50 percent from the start of the year. With the final sale at $100 a share, MMM's gain was 32¼. Others that showed spectacular gains: Colgate-Palmolive-Peet, American Cyanamid, Freeport Sulphur, Industrial Rayon, Libbey-Owens-Ford, McKesson & Robbins, Owens-Illinois Glass, Parke Davis, Chas. Pfizer, Sharp & Dohme (up 67 percent from 23 to 38½), and Sun Chemical.

Those stocks that showed drops were a queer mixture: Atlas Powder (which had not shown the postwar earnings expected by some); Bristol-Myers; General Tire and U. S. Rubber (yet Goodrich and Goodyear posted gains); Heyden Chemical; Koppers; Publicker (yet USI was up); Rayonier (yet Industrial Rayon showed a 34 percent gain). Two of the others showing drops were petroleum companies (Shell and Jersey Standard). The last three were St. Regis Paper, United Carbon, and Virginia-Carolina Chemical (paying no dividend these days).

But if these few were down, the big majority were up. And the bull market looked good for quite a while. And all the forecasts were good—"excellent for the first half of 1950; we can't guess beyond that." Chemical managements hoped that they could be even more optimistic, but they had their fingers crossed. The investors didn't.

SHUFFLES AND DEALS

Not Too Many

Purchase by Mathieson Chemical of Southern Acid and Sulphur and of Standard Wholesale Phosphate and Acid Works highlighted the few mergers of 1949. The merger of these companies gave Mathieson a desirable diversification of its business. A sidelight: Mathieson moved headquarters from New York to Baltimore.

Alien Property Custodian was still looking for purchasers for General Aniline and Film and for Schering Corp. The latter will be sold this spring, but sale of GAF was tied up by the courts for a long time to come.

In another, though small, deal Du Pont and General Motors agreed on sale of Kinetic Chemicals (51 percent Du Pont, 49 percent GM) to Du Pont—it awaited SEC approval.

STOCK SPLITS

Four-for-One

There were not too many stock splits by CPI companies during 1949. But one made news; and the lack of one was news, in a sense.

Du Pont's four-for-one split was the big one, overshadowing all the others. Du Pont, long a blue chip, had traditionally been a high priced stock. With a price of 180-190, it was out of range of the average small investor, who had a little money and wanted to distribute his holdings. Hence, the 4-to-1 split. That brought the price down below 50, but it did not stay there long. By the end of the year it had risen above 60 (equivalent to 240 on the old stock).

At the other end of the line was Allied—another "blue chip." Long considered a safe and good investment, Allied's stock was the only one in the CPI selling even near 200—and it closed the year at 205. Shrewd but conservative (no quarterly earnings figures given out, only the barest of annual statements), Allied's management had made no apparent moves toward a stock split that would result in wider distribution. Moving slowly, its expansion rate was far below other chemical companies. It was even threatened with losing third place in the industry (behind Du Pont and Carbide) to American Cyanamid. But there was never any question that Allied's stock was not still "blue chip."

GENERAL OUTLOOK

The First Half

Industry hit 1950 in high gear—and with bright prospects. Prosperity promised to continue until June at least. And—even with economists debating on 1950's second half—the year looked "very good."

For six months, 1950 will show little change from 1949. Production (Federal Reserve Board, 1935-39 = 100) should run 170-180. More estimates: less than 4,000,000 unemployed; a firm price level; steel production (the bellweather) at close to 90 percent of capacity; automobile and appliance production at 1949 levels or better.

Retail business—helped by the $2.8 billion insurance dividend being paid veterans—promises to equal or better a year ago. High employment and consumer incomes will maintain retail sales.

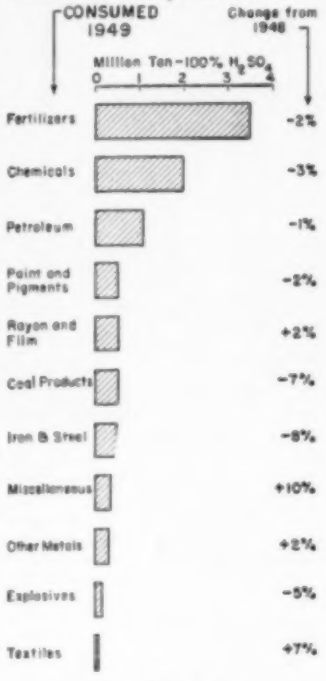
The construction industry—a mainstay of prosperity in 1949—expects another year as good as last. Expected 1950 construction is $19.2 billion, the same as 1949. A rising volume of public works and public housing will offset a forecast drop in industrial building.

Investment in new plants and equipment will drop 13 percent in 1950, according to the McGraw-Hill survey (p. 117). If this size decline had hit all at once, it would dim prosperity prospects. But industry has already adjusted to the lower level. Capital expenditures declined each quarter in 1949. Production figures in the capital goods field suggest the key machine industry has already passed the bottom point.

The Second Half

The outlook for 1950's second half is not as clear. Backlog demand for steel (due to the 1949 strike) will end by midsummer. And production of consumer-durable goods may fall off. The automotive industry, for example, expects a 10-20 percent drop. Consumer income may slide. The GI dividend lift will be gone. Farm income may drop 10 percent below 1949. Government spending and exports may fall off.

However—there is still a good chance business will run at a high level through the second half. Two things (at least) could offset the expected declines: government spending may increase; the decline in capital expenditures may be reversed. This is an election year, and Congress may up spending enough to help business. Capital expenditures may turn up too. Most companies review their capital programs monthly. Good business in the first half may lead to more investment than is now planned.



SULPHURIC

Contact Up, Chamber Down

Production of acid during 1949 showed a continuing trend to contact operations. Data based on ten months census returns and trade opinions shows that production at contact acid units was up about 240,000 tons while chamber operations slipped off by about 233,000 tons in the first nine months alone. While production of new acid dipped to 10.1 million tons last year, output of gross acid, including fortified spent, was slightly above 1948. The breakdown of sulphuric acid consumption is based on the amounts of new acid used.

& DEMAND

Sulphuric acid consumption dropped off in 1949. Use of new acid was down about 1 percent. Reason: chemicals, coal products, iron and steel, industrial explosives, and petroleum refining all took less than in 1948. *Chemical Engineering* estimates consumption, by industries, as follows:

Sulphuric Consumption
(1,000 short tons, 100% H_2SO_4)

Consuming Industries	1947 Revised	1948 Revised	1949
Fertilizers	3,410	3,480	3,470
Chemicals	2,010	2,100	2,090
Petroleum refining	1,180	1,220	1,210
Paint and pigments	665	680	670
Coal products	698	670	630
Rayon and cellulose film	610	640	650
Iron and steel	540	565	520
Other metallurgical	315	320	325
Industrial explosives	125	130	123
Textiles	73	70	75
Miscellaneous	380	370	377
Total Consumption	9,930	10,235	10,100

Sulphuric acid capacity hit 13,000,000 short tons in 1949. This includes about 975,000 short tons new capacity and a small drop in chamber units.

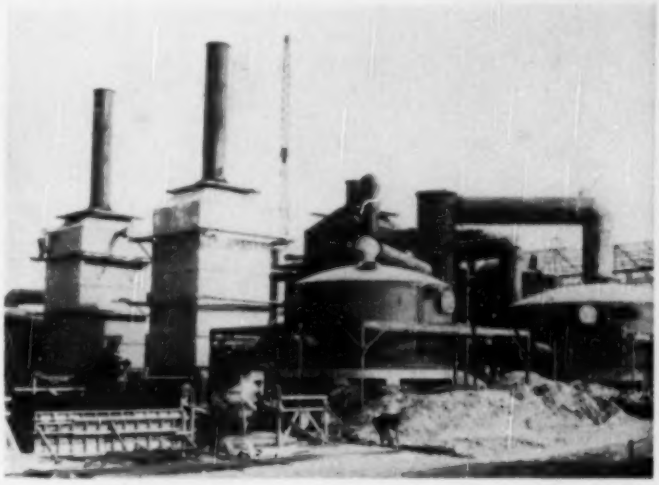
Where did the acid come from? Last year 8,045,000 tons of acid were made from sulphur. About 1,330,000 tons were made from imported and domestic pyrites. Almost 750,000 tons came from smelter operations. Acid from hydrogen sulphide reached 80,000 tons in 1949.

CHLORINE

More and More

Chlorine supplies hit a new high last year—and what's really remarkable, so did consumption. Chlorine is the only heavy chemical that did not slip back last year. Output (1,735,000 tons last year) continued to break all-time records and far surpassed the former peak years of World War II. At the end of the war chlorine capacity was double 1939. Many producers were afraid the peacetime economy could not absorb this wartime growth. No crystal ball could have been more clouded. Since 1946 capacity has increased about 20 percent and more will come in this summer.

The consumers have not only absorbed all of the increased supplies—they still keep producers jumping to fill demand. Growing use of chlorine chemicals is the major reason for the continuation of a seller's market, even though there have been some minor cutback in operations as a result of labor troubles. (See Manpower) Pulp bleaching, water treatment and other bleaching took about 22 percent of the chlorine shipped. Chemicals took most of the remaining 78 percent. Textiles and other miscellaneous uses (including exports) took about 3 percent.



SULPHUR

More From Fuels

From plants like this new Texas Gulf Sulphur unit at Worland, Wyo., is coming more elemental sulphur each year. It strips sulphur from natural gas. In 1949 output from fuel gas had climbed to 70,000 tons of sulphur. This was a gain of 16,000 tons over the 1948 production from this source. While this was only a small amount compared with total domestic shipments, it is a fast growing factor that will bear watching. Domestic shipments of brimstone came to 3,550,000 long tons in 1949. Along with other phases of the sulphur balance, it points up the sharp switch in business conditions that developed late in 1948 and continued into 1949.

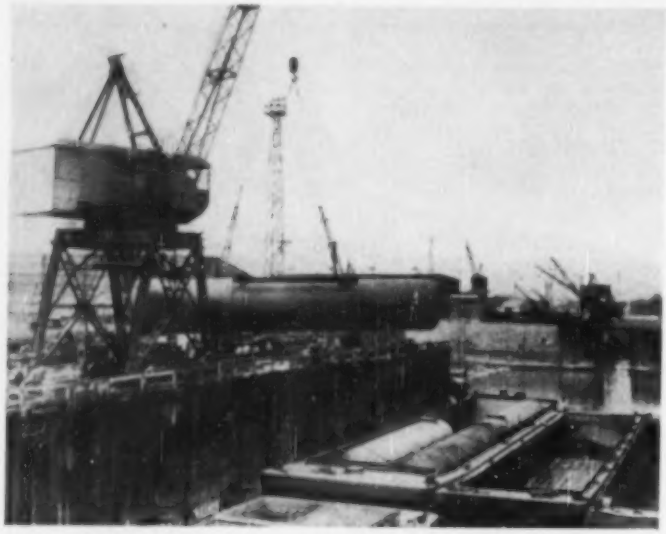
The hike in exports shows the recovery of European industries. Since sulphur is the raw material for the bellweather of heavy chemical activity (sulphuric acid), it indicates that industrial activity in Europe is well on its way back to a high level.

The increase in users' stock changes is purely a paper increase this year, as was the case last year. Sulphur companies continued to liquidate their stockpiles on consumer property and this exchange of title for sulphur (already delivered to customers) brought up users' stock by 100,000 tons although the physical piles of sulphur remained about the same. An increased supply of pyrites was used in acid production in 1949. However, acid from this source remained small compared with the great bulk of acid coming from brimstone.

The sulphur activity for the years 1948 and 1949 is shown below. This balance was prepared by *Chemical Engineering* with assistance of trade sources. The 1949 data are preliminary. They are based on the data published by the Bureau of Mines and Department of Commerce.

Supply and Demand
Sulphur and pyrites long tons; acid short tons

	1948 (Revised)	1949
Sulphur mined	4,869,000	4,750,000
Sulphur exports	1,262,000	1,350,000
Domestic shipments	3,752,000	3,550,000
Approximate mine stocks, Dec. 31	2,700,000	2,650,000
Sulphur recovered from fuel gases	54,000	70,000
Users stock changes	+70,000	+100,000
Non-acid uses of sulphur	998,000	922,000
Sulphur available for acid	2,728,000	2,698,000
Acid from sulphur	8,232,000	8,045,000
Pyrites imports	107,000	120,000
Domestic pyrites	929,000	930,000
Acid from pyrites	1,308,000	1,330,000
Acid from smelters	641,445	750,000
Acid from H_2S	75,000	80,000
Total acid made	10,235,000	10,100,000



HYDROCHLORIC

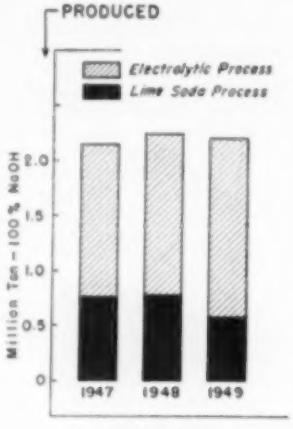
Barges for Byproduct

Growing supplies of hydrochloric acid kept producers busy finding markets. Reason: a growing tonnage of byproduct acid in 1949. The problem also created worries in the salt cake industry. Some firms using the traditional method of producing HCl (which produces the acid and salt cake as coproducts) found themselves in the unhappy position of manufacturing two chemicals for which the demand was soft.

Largest uses for the acid are in the metal industries, petroleum production, and chemical manufacture. A fast growing market for oil-well treatment has taken up the slack in some areas, and water borne shipments in special barges have been used to solve the problem of getting the acid from the producing areas to the industrial sections requiring large quantities.

Dow has started barge service from Texas to points along the Mississippi and its tributaries in an effort to compete with producing units closer to eastern consuming areas. (Cut shows barges under construction.)

Disposing of this relatively cheap acid is a complex distribution problem. The growing chlorinated organic solvent industry is located near its organic raw material sources and unfortunately these sources are far from the metal producing regions and some oil well operations. For example: a producer in upper Texas sells acid (made by the expensive H, plus Cl, method) cheaper than a Gulf Coast producer of byproduct acid can sell it in that area. The reason: rail freight charges to move the acid across the state.



CAUSTIC SODA

Dearth of Salesmen

Caustic soda was a problem child last year. In a survey of alkali producers the number one problem reported was "selling caustic." The problem was not simple. As a coproduct of chlorine, a fast growing chemical with a big demand, electrolytic caustic poured onto the market, kept salesmen stepping to find outlets. Result: As electrolytic production climbed higher, lime-soda caustic hit the skids. By the end of the year, total net caustic output was down almost 160,000 tons (to 2.2 million tons). However, this is a high production rate when compared with other prosperous years. Even 1947, a good year in anybody's book, was 70,000 tons under 1949. Highest wartime output was below 2 million tons per year.

During the last months of the year, markets strengthened and stocks were normal. On the consuming side of the picture there were no spectacular gains, even rayon didn't make its usual percentage increase, due to the slump in textile markets. (*See Synthetic Fibers*). Soap, chemicals, petroleum, textiles, rubber, pulp and paper, all took less caustic in 1949 as a result of the over-all shake down in business. Exports also hit the skids. Here is *Chemical Engineering's* detailed break down of caustic consumption:

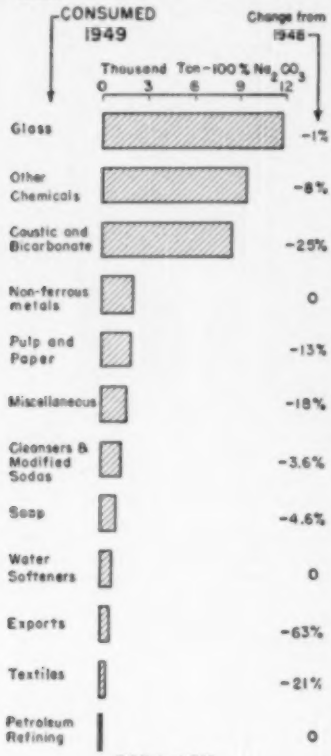
Consuming Industries	Caustic Consumption (1,000 short tons, 100% NaOH) 1947 (revised)	1948 (revised)	1949
Soap	160	154	145
Chemicals	670	720	650
Petroleum refining	150	170	160
Rayon and film	455	500	500
Lye, cleansers	120	130	130
Textiles	103	100	90
Rubber reclaiming	27	28	24
Vegetable oils	20	21	22
Pulp and paper	160	176	170
Exports	138	183	165
Miscellaneous	125	167	147
Total Consumption	2,130	2,387	2,200

POTASH

Strike One—And Out

Chemical use of potash dropped off—at the end of the third quarter some 17,500 short tons (K_2O) below 1948. On the other hand, fertilizers grabbed a bigger chunk of the expanded output—a gain of about 8 percent. All of this gain was chalked up by KCl, heading for a record year when labor trouble intervened. For all practical purposes the potash industry's producing year ended when all Carlsbad operations ground to a halt in November (*See Manpower*). The strike effectively halted 85 percent of domestic capacity. That ended the chance of potash supplies catching up with demand, and early in 1950 mixing operations were

thrown out of balance. This in turn clogged pipelines with other mixed fertilizer components (see above). 1950 would be a tight year for potash users.



SODA ASH

After Records, a Drop

Biggest of the alkalis, soda ash felt the impact of receding markets last year. Glass took less and so did soap, chemicals, pulp and paper, textiles, and other minor uses. Exports really dropped—from 207,000 short tons in 1948 to a mere 77,000 in 1949. Here the break was due to the world dollar problems and devaluation, along with rejuvenation of European producing facilities.

With the increased producing capacities available in this country as a result of the postwar expansion, producers were looking forward to the days when the demand would start climbing back to the 1948 rates. Actually, some of the drop in ash production was due to labor troubles (See *Manpower*) as well as the slackening demand. Sales efforts in the ash markets did not reach the intensity required in the case of caustic soda. But sales managers were busy keeping the supply and demand in balance.

Shown below is *Chemical Engineering*'s estimate of the amount of ash taken by the major consuming industries.

Consuming Industries	Ash Consumption (1,000 short tons, 100% Na_2CO_3) 1947 (revised)	1948 (revised)	1949
Glass	1,440	1,370	1,190
Soap	135	130	125
Caustic and bicarbonate	1,130	1,137	850
Other chemicals	1,030	1,030	950
Cleansers & modified sodas	130	135	130
Pulp and paper	260	250	200
Water softeners	100	110	110
Petroleum refining	22	24	24
Textiles	71	69	55
Non-ferrous metals	190	210	310
Exports	107	207	77
Miscellaneous	185	220	179
Total Consumption	4,900	4,872	4,100

Stumbling block of natural ash expansion last year was the basing point problem (see *Law*). When this situation clears up, a sizable growth is coming.

A major development in the caustic consumption pattern which will bear watching is the growth of synthetic detergents. Use of caustic here is fast approaching 40,000 tons per year.

NITROGEN

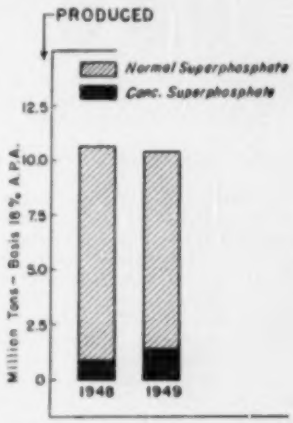
Reluctant Farmer

Supply and use of nitrogen for fertilizer changed radically in the last few weeks of 1949. The comfortable situation existing at Thanksgiving has been converted into a complicated, unpredictable confusion. Facts: Stocks of ammonium sulphate have piled up seriously. To a lesser extent ammonium nitrate has not moved, but stocks are not as heavy as ammonium sulphate. Synthetic ammonia production has continued below capacity.

During the war farmers bought fertilizer whenever they could get it. That habit was broken sharply in 1949. Fertilizer sales hit bottom from July to September (like prewar). But the expected buying did not begin in October and November. Even December was slow. This return to seasonal fertilizer purchasing accounts for the piling up of ammonium sulphate and for high stocks of mixed fertilizer. This may again cause a serious difficulty in the physical movement of goods when buying does begin in the late winter. And of course the production of ammonia and of potash (lost by cutback in plant operation and strikes) can never be made up since capacity operation would be expected during the late winter and spring months anyway.

Farmers are worried about price supports, acreage restrictions, and crop goals. So many have held back in planning for spring planting. The only offsetting factor is the tendency of farmers to increase both fertilizer and closeness of planting when acreage is cut back. They hope they may get as much cash crop from the smaller acreage as they commonly receive from larger unrestricted acreage.

Over-all nitrogen production this year should come close to 1949. But fertilizer use may be 5 or 10 percent less. Fertilizer consumption has been rising steadily. Even a 10 or 15 percent cut in 1950 would mean only a drop to the all-time record in 1947-48.



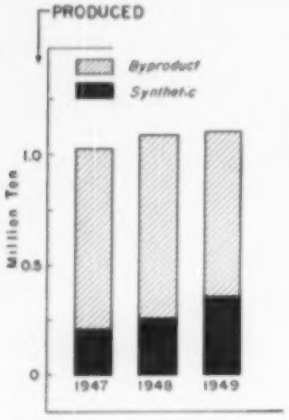
PHOSPHATES

Concentrated Super Gains

Fertilizers continued to dominate the phosphate supply-demand picture this year. As in the past, superphosphate capacities are far in excess of demand. As new sulphuric acid capacity came in, more new acidulating units went to work. A number of new plants making concentrated superphosphate went on stream in the last year—more than enough to take care of any commercial demand for superphosphate. Production of phosphoric acid type fertilizers has grown steadily.

According to the Department of Agriculture 1.85 million short tons (P_2O_5) were made in the 1947-48 crop year. More than 1.9 million short tons (P_2O_5) were made in the 1948-49 year and 2.1 million short tons (P_2O_5) will be made in the current crop year ending June 30.

Whether or not this level is reached depends on several factors (see *nitrogen*).



AMMONIUM SULPHATE

Synthetic Jumps Again

Fast growing, synthetic ammonium sulphate is becoming an important component of the total domestic supply. Today only about 70 percent is made as a byproduct of the destructive distillation of coal.

Industrial use of this product has tripled since 1935. Production has almost doubled in the same period. However, it is losing ground as a component in fertilizers. In 1935, 42 percent of the N_2 in fertilizers was obtained from ammonium sulphate. Last year this had dropped to 25 percent of all N_2 consumed in fertilizers (losing ground to ammonium nitrate). It is largely used in mixed types. Only 20 percent of the chemical used in fertilizers is directly applied to the soil.

At the present time, 12 plants are manufacturing ammonium sulphate from anhydrous ammonia. The capacity of converters in this type operation now exceeds 600,000 tons of ammonium sulphate per year.

Production of synthetic ammonium sulphate by firms such as Shell, Southern Acid and Sulphur (now Mathieson), Arkansas Fertilizer Co. and others has materially decreased the importance of coke-oven ammonium sulphate.

COAL CHEMICALS

Benzene is Tight, Supply Down

Late last year *Chemical Engineering* polled top chemical companies to find out what the biggest supply problems were in 1949. Benzene was listed in the vast majority of returns as being the "hardest to get." A look at the production record gives the reason. Output for the first eleven months of 1949 was about 22,500,000 gal. below the corresponding 1948 rate. Reason: labor troubles and a slowdown in demand for steel (with concomitant slowdown in coke oven operation).

To properly understand how tight benzene was in 1949, it is necessary to realize that benzene was about 6 percent behind demand in 1948 and that chemical markets for benzene have been expanding ever since the war. Nylon alone has upped benzene use from 11 million gallons in 1942 to about 25 million gallons in 1949. The chloro-benzene phenol process took 9 million gallons of benzene in the first half of 1949 alone—more than the 1941 annual use. During October, a strike month, stocks of nitration grade benzene dropped 38 percent, to 346,000 gal. (in October 1948 stocks had been almost 2,000,000 gal.).

Before the October strikes there was some evidence of a softening benzene demand. But at the end of the year that trend was reversed, and early in 1950 benzene prices jumped up to 22c. per gal.

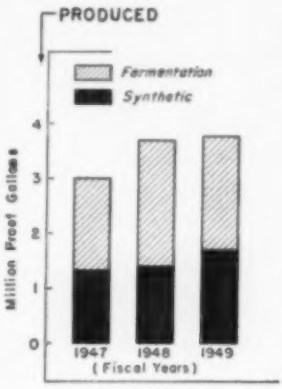
XYLENE & TOLUENE

Petroleum Helps

In the last few years, petroleum has been gaining on coal tar as an aromatic raw material. Toluene and xylene are two chemicals that have benefited. In 1949 more than half of the toluene output came from petroleum sources. In the past few years about 85-90 percent of all xylene was based on petroleum.

Because of this increasing influence of petroleum, xylene and toluene were not too hard hit by the steel and coal strikes last fall. But in November and December the light oil chemicals, benzene, toluene, and xylene were in heavy demand. Production from petroleum sources was completely sold out in November.

The supplies of these products will not catch up with demand before the second quarter of 1950.



ETHYL ALCOHOL

Bigger Cut for Synthetic

The price weakness in the alcohol and solvent business, which started late in 1948, became acute in the first quarter of 1949. The demand for lower boiling alcohols was better than expected, but prices during the first quarter were the lowest since 1931.

As the year opened, the alcohol price structure was very unsettled, due to a contract made by Publicker with the Cuban government in which the price of molasses was determined by the price of alcohol. The price of alcohol dropped from 30 to 21¢ a gal. in six weeks. A large spot sale was made well below 21¢.

The terms of Publicker's contract apparently provided that a substantial quantity of molasses be taken over a three-month period. When alcohol prices dropped, Publicker maintained the payments made when alcohol was higher priced were adequate to cover more molasses than the original quantity paid for. The Sugar Institute in Cuba apparently did not accept this viewpoint and refused to load Publicker's cargoes. After some further renegotiation, Publicker arranged a new deal, getting a preferred molasses price of 0.75¢ per gal. This had the effect of stabilizing molasses at 4.75¢ to the trade as a whole, and 4.0¢ to Publicker.

As a result of inventory losses on molasses and higher freight and steel drum price, operating losses at the end of the quarter for all companies were substantial. It was obvious that a price rise was in the making or some of the fermenters would face bankruptcy.

At the beginning of the second quarter all of the fermenters went on a 30-day basis but indicated that the rise would not be more than 9.0¢ per gal. The increase actually took place July 1 and amounted to from 8.5-11.0¢, depending upon the formula. The price structure held firm for the balance of the year, although some unfulfilled contracts were priced below the market.

Since synthetic ethanol producers had met all price reductions and held their sales volume, the amount of molasses consumed did not exhaust Cuban stocks. There was an overhang of 75-80 million gallons. This situation was somewhat relieved when the newest synthetic producer had difficulty with its operations and released one of its major accounts which, for the balance of the year, purchased fermentation alcohol.

In the third quarter the fermenters were again upset when the Economic Cooperation Administration announced that Great Britain had bought 70 million gallons of molasses at 3.25¢ per gal., 0.5¢ below the lowest price to United States' producers. Protests from the U. S. fermenters resulted in ECA reversing itself and holding up payments to Great Britain.

Ethyl alcohol production for 1949 was about 174 million gallons, 2 percent greater than 1948. About 60 percent was synthetic alcohol.

Through a Knothole?

The big problem today: existing plants can produce at least 50 percent more of every type of solvent than present consumption demands. In some cases the excess capacity is nearly 200 percent. This month the first Fischer-Tropsch plant (Carthage Hydrocol at Brownsville, Tex.) will start up. The quality of the solvents this plant will turn out is the competitive question. This quality angle is of particular interest, as another synthetic producer (with a process basically similar to Fischer-Tropsch) has been offering solvent mixtures at very low prices, but has had trouble meeting specifications.

U. S. Industrial Chemicals, to market Brownsville's output, will thus shift almost completely from fermentation to synthetic products.

Even though the sugar crop may decline 5 percent in the coming season, there should be a molasses surplus each year for several years to come. But fermenters apparently cannot regain business on a price basis alone. Even if molasses prices are down this year, increased costs of fuel, freight and labor should prevent further violent ethanol price cuts.

Overhanging the market are big surpluses of farm products. There probably will be a new wave of suggested regulations to use these surpluses in industry. If any become law, fermenters will be faced with operating as contractors for the government, or competing with government-owned plants.

On the optimistic side, demand for synthetic textiles should zoom output. This means more alcohols and solvents as chemical raw materials or solvents. That could put supply and demand in balance.

METHANOL

Truth Hurts

Methanol production for 1949 was approximately 126 million gallons, 19 percent less than 1948. Predictions that 1949 would see a methanol surplus became painfully true.

Amonia demand declined somewhat just when new methanol production was coming in, and the new producers immediately reached for the anti-freeze market. But due to the war winter of 1948-49, there were at least 30 million gallons of unsold anti-freeze in the field. Another mild winter held sales below the estimated 20 million gallons. By the end of 1949 U. S. motorists only used half as much as industry had hoped. In fact one large anti-freeze seller, who sold 4 million gallons in the 1948-49 season, had sold only 700,000 gal. by the end of December. The fact that glycol was readily available also hurt. It is estimated that 34 million gallons of glycol were sold for anti-freeze.

In the second quarter thermosetting resin demand fell off. This meant and over supply of formaldehyde, skidding prices, a further cut in methanol demand.

Newer methanol producers, after the Supreme Court decision on basing points, elected to sell fob plant, rather than delivered, and made up the difference in freight by adjusting their plant price. This meant at least four different base prices, so sale of methanol became almost regional (see Law).

Production of wood distillation methanol was off 35 percent from 1948, due to spotty demand for completely denatured alcohol.

ISOPROPYL ALCOHOL

Thorn in Ethyl's Side

Isopropyl alcohol production was roughly 105 million gallons, 15 percent less than 1948.

When fermenters cut ethanol prices, they not only hoped to gain business from synthetic alcohol producers, but hoped to regain what isopropyl alcohol had taken away from ethyl during the war. Isopropyl producers, however, met all price declines. Hence, the only gallonage lost was marginal, where the gap between isopropyl and ethyl did not make up for inherent technical differences.

Because of the decline in the whole alcohol and solvent market, isopropanol was not as short as the previous year. But at the end of 1949 inventories were nominal.

KETONES

For Some, a Balance

The acetone market was relatively firm and production was close to 60 million gallons. Exports dropped after devaluation. Acetone plants in Europe are now nearing completion, so much of the export market will be lost permanently.

During 1949 the supply of methyl ethyl ketone was in balance, partly because one producer was shut down for a time by a fire. Demand for vinyls, down during the summer, picked up later, consuming more methyl ethyl ketone. Increased MEK solvent use has hurt ethyl acetate—but only slightly. A large molasses fermenter made special efforts to recapture business by making special concessions on acetic acid, cutting his cost for ethyl and butyl acetates.

The demand for methyl isobutyl ketone continued strong in 1949, both as a nitrocellulose solvent and in vinyl resins. The demand for MIBK helped strengthen acetone and isopropyl alcohol markets, which MIBK is made from.

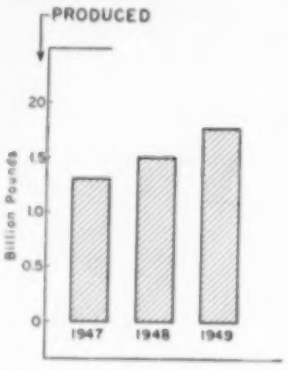
HIGHER SOLVENTS

Lower Demand

Demand for higher alcohols and acetates declined about 16 percent during 1949, partly due to competition from other solvents and partly due to a gradual shift in types of protective coatings. While nitrocellulose producers reported a satisfactory year, the type of coatings into which nitrocellulose goes requires lower boiling solvents. Furniture production was below forecasts so lacquer demand was down.

Demand for secondary butyl alcohol and acetate was down in 1949 since prices were higher than competitor methyl isobutyl ketone.

When methanol and ammonia sales dropped, one large methanol producer again started to produce isobutanol, which it had not made for several years. As this company is also a consumer, it cut back purchases of normal butyl.



PLASTICS

New Records in a Slow Year

A big blow to the sky-rocket rise of synthetic resins was the sharp drop in demand for thermosetting molding materials. Consumption of this type of plastics was down about 10 percent from 1948.

This does not mean the synthetic resin industry had a bad year. Production reached the 1.8 billion pound mark. 1949 was another record year. But, return of the buyer's market late in 1948 did slow down the trend line.

It looks like 1950 will set another record. The reason: thermoplastics. Polyethylene, for one, has moved into the bulk packaging market, as well as consumer packaging. Polystyrene is making a real bid in the home construction market, with special emphasis on wall tile. Vinyl film and sheeting have grown. Upholstery alone took 50 million pounds in 1949 and will take more in 1950. Leather is facing stiff competition. Shoe soles are no longer an exclusive leather market. This year about 50 percent will be vinyl-bond.

Bright spot in the future of thermosetting resins is the development of larger molded parts—heavy pieces like Admiral's 35-lb. television cabinet. These large molded pieces may open up new markets for compression molding compounds. Low pressure curing resins may also help molding compounds to regain some of the volume they lost in 1949.

Newcomers on the plastics scene include isopropenyl acetate and allylidene acetate. They can be copolymerized with vinyls. The fluoroethylenes, Teflon and Kel-F, continued to expand and, like rumbling volcanos, promised greater things to come. Late in the year Du Pont erupted with the promise that mid 1950 would see commercial quantities of Teflon coatings —colloidal suspensions of the resin that can be sprayed onto metal and baked. And Kellog's research laboratories are bubbling with comparable developments for Kel-F.

SYNTHETIC FIBERS

Rayon Slips

For the first time since 1938 rayon did not set new production records. In fact 1949 rayon output was down about 12 percent. The trap door was sprung for the rayon market in March and the industry hit bottom in April. Then began the long climb back. In August shipments passed the 1947 monthly average (79.3 million pounds), by September shipments passed the 1948 monthly average (91.7 million pounds). In the last three months of the year consumption hovered around the 100 million pound-per-month mark.

Other synthetic fibers hit new highs in 1949. Nylon, still in short supply, surged up to new producing feats in the past year. Production now runs more than 100 million pounds per year. More capacity is under construction (See *Plant*).

Vinyl fibers are also finding wider applications and bigger markets. Still small but coming fast are the family of acrylic fibers—orlon, dynel, Chemstrand, and others. Experts predict that this class of fibers will have a market as big as nylon's in a few years. Currently only American Cyanamid produces acrylonitrile, an essential raw material in all these fibers. Protein and glass fibers also got a boost last year. Fiberglas brought in a new plant on the West Coast as demand spread.

RUBBER

Consumption down, outlook good

Rubber consumption in 1949 was 980,000 long tons, slightly below 1948's 1,069,000 long tons. According to B. F. Goodrich's John L. Collyer, 1950 will see a continued strong demand—he estimates 1950 use of all rubber at 935,000 long tons. U. S. Rubber's Harry Humphreys thinks 1950 consumption will be about the same as 1949.

Synthetic rubber grabbed a bigger share of the market, percentagewise, in 1949. About 410,000 long tons of synthetic flowed into consuming channels. This was 188,000 above government requirements. During the past year capacity of cold rubber—which arrived on the scene in 1948—was increased to about 200,000 long tons.

Worldwide consumption of rubber reflects the recovery from wartime dislocations. More than 1,870,000 long tons were used, an increase of 62 percent over the 1,150,000 long tons used in 1940.

Butyl rubber, used for inner tubes, has shown that it can more than hold its own in a free market. Since late summer all mandatory controls have been lifted. Production last year was 52,000 long tons—far above the minimum consuming requirements. While production was off 6,000 long tons from the 1948 rate, it held up better on a percentage basis than natural rubber. In 1948 and 1949 almost 72 percent of all inner tubes were made from butyl rubber. This year's figure will be even higher.

Butyl is being made in two government-owned, privately operated units. The Baytown, Tex., unit (30,000 long tons per year) is operated by Humble Oil; the Baton Rouge plant (three 14,000 long ton units) is run by Esso Standard. The government has shut down two of the three units at Baton Rouge to bring production into line with consumption.

LABOR

World Wide

BLACK GOLD

To Strike or Not to Strike

John L. Lewis, Harry Truman, and their cat-and-mouse act with the Taft-Hartley Law dominated the 1949 labor scene—for the chemical process industry as well as for industry as a whole. By year's end the record stood at three major coal strikes, almost 30 percent less coal mined than in 1948, and a continuing three-day work week that was slowly but surely squeezing chemical producers.

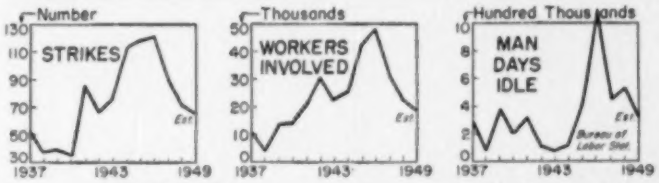
Lewis, despite his three strikes, never let coal stocks get to the point of badly damaging chemical production. But the threat continued. In Charleston, W. Va., heart of Lewisland, Carbide and Carbon was buying coal by truck from little, family-owned mines. Production from these mines kept up despite Lewis' antics. Fifteen miles up the Kanawha River, Du Pont converted two of its big boilers to temporary oil-firing. Oil was not yet economic as a regular fuel in West Virginia, said Du Pont, but the break-even was getting closer by the day.

If coal stocks held just above the danger level, the steel and coal strikes gave one definite headache. More companies in *Chemical Engineering's* survey cited benzene as their major chemical supply problem than any other chemical.

Strikes: 1949 (6 mos.) vs. 1948

	No. of Strikes		Workers Involved (Thousands)		Man Days Idle (Thousands)	
	1948	6 mos. 1949	1948	6 mos. 1949	1948	6 mos. 1949
All industries	3,419	1,907	1,960	1,680	34,100	15,100
Manufacturing	1,675	884	950	673	17,000	6,160
Chemicals & Allied	73	39	21	11	538	191
Paper & Allied	40	20	10	7	142	233
Products of Petroleum and Coal	13	8	21	1	753	20
Leather & Leather Products	45	39	10	12	218	185
Stone, Clay & Glass	90	29	22	6	365	46
Mining	614	255	651	946	10,400	5,480

Data—Bureau of Labor Statistics



BOX SCORE

The Best in Years

Just how good were chemical industry labor relations in 1949? That's an open question. Industry executives say it was a bad year—strikes were numerous and bargaining tough. Yet here is what the Bureau of Labor Statistics comes up with—

68 strikes—the lowest number since 1942.

18,000 workers involved—the lowest number since 1940.

300,000 man-days lost by strikes—the fewest since 1944.

That means that 1949 was the best labor relations year since the middle of the war. If it sounds unbelievable, *Chemical Engineering* checked and rechecked—BLS ran a special total on the chemical industry for us, and those are its figures.

Few strikes in the chemical process industry received nationwide publicity. Individual strikes affected only slight percentages of the industry as a whole—because no single union yet dominates it.

The 1949 strike battleground involved four contestants: the CIO's Gas, Coke and Chemical Workers; the AFL's Chemical Workers; the UMW's District 50; and the several strong independent unions which are factors at individual plants. Competition between these groups was one unsettling problem during the year (see *Chem. Eng.*, Nov. '49, p. 185).

These were some of the major strikes in the 1949 chemical picture:

Carbide & Carbon. In January some 3,120 construction workers at Carbide's big Texas City, Texas, plant walked out, demanding a wage increase and improved working conditions. The workers were members of AFL's Galveston Building and Construction Trades Council. The strike, which began January 23, finally ended on March 6 with a 14-18c. wage increase granted.

Diamond Alkali. Demanding a 25c. wage boost, pensions and other benefits, 2,250 members of UMW's District 50 walked out of Diamond Alkali's Painesville, O., plant on October

5. This put a total of 3,400 employees out of work and cut off gas to the homes of nearly 100,000 people (Diamond's coke ovens supply gas to local utilities). The strike ended on October 18 with the company granting a 5c. wage boost and three paid holidays.

General Chemical. Some 1,000 members of District 50 struck at the Marcus Hook, Pa., and Clayton, Del., plant of General Chemical on February 24. The company and union were at odds over new contract provisions and wages. On March 16 the strike ended with the signing of a new contract and 3-6c. hourly wage increases.

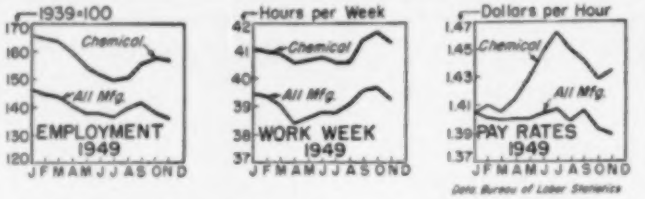
Potash. At Carlsbad, N. M., 1,600 members of the CIO's Mine, Mill & Smelter Workers struck against three companies on November 19. Hit were International Minerals & Chemical Corp., Potash Co. of America, and United States Potash Co. Although the strike was officially over a 25c. wage demand, there were undertones. The union, long considered leftist, was slated for expulsion by the CIO. One of the possible considerations: to show the CIO executive committee its strength, avoid expulsion. The strike was still going strong at year end, but it looked like it might not last too long. NLRB was readying injunction proceedings under Taft-Hartley (see Chementator, pg. 70).

Parke, Davis. Suspension of an employee by Parke, Davis' Detroit plant turned into a 2,000 employee walkout by the CIO Gas, Coke & Chemical Workers on June 30. The men came back to work the next day when the company agreed to keep the fired employee on the payroll, pending grievance negotiations.

Masonite.* Some 1,500 employees of the Masonite Corp. at Laurel, Miss., ended a five-month-old strike on August 30. Under pressure from the state governor and a local citizen's committee (Loss of the plant's $100,000 a week payroll had paralyzed the city economically), the members of the CIO's International Woodworkers of America finally voted to accept the company's proposal: a 40-hour week, a two cent raise, and four paid holidays.

Solvay. A dispute over seniority caused some 750 employees of the Solvay Process Div. of Allied Chemical & Dye to strike in Detroit on May 3. The strike, called by UMW's District 50, finally ended May 25 with a 5-14c. pay increase and an agreement by the company to make every effort to have layoffs follow seniority.

* BLS carries this strike under "Paper and Allied," not "Chemicals and Allied."



FAR FASTER than all manufacturing has been the chemical industry's growth since 1939. But chemical employment nosedived more than industry in general during last summer's "recession" (chart, left). Those employed constantly hit better than a 40-hour week, compared with a 39-hour average for all manufacturing. Wages, even with all manufacturing at the beginning of 1949, zoomed in the summer, ended the year well above industry in general.

Mathieson. On August 2, employees of Mathieson Chemical Co.'s Pasadena, Tex., plant walked out over a company refusal to accept filing of mass grievances. The union, CIO Oil Workers International, demanded a 15c. raise, a 36-hour week, double time for overtime, and seven paid holidays. The strike never finally ended. The plant is now running at capacity, the Oil Workers have no contract, and Mathieson has announced it does not consider the Oil Workers are the bargaining agent any more.

Safety Figures

(Disabling injuries per million employee-hours worked.)

	1948	9 mos. 1949
Compressed & liquified gases	9.2	6.9
Drugs, toiletries & insecticides	10.7	9.4
Explosives	4.3	1.6
Fertilizers	27.3	26.1
Industrial Chemicals	10.9	7.7
Paints, varnishes & colors	15.4	7.4
Plastics matls., ex. rubber	6.4	4.2
Soap and glycerin	7.5	6.0
Synthetic rubber	1.7	2.0
Syn. textile fibers	5.4	3.0
Chemicals not elsewhere classified	12.3	9.8

Data: Bureau of Labor Statistics.

FAR SAFER. Without much question, 1949 was the safest year the chemical industry has ever had. Injury rates were down on almost every count. But first place in safety may have been lost by the synthetic rubber plants to the explosives plants, hazardous though they are. The chemical industry could point to another safety achievement: Du Pont's Martinsville, Va., nylon plant holds the world's safety mark—more than 21,000,000 man hours without a disabling accident.

Consolidated. Another series of strikes that unions apparently lost were against Consolidated Chemical Industries. At Fort Worth, Tex., District 50 began a strike on August 20 (70 men involved). By September 26, new and white collar employees had the plant running at capacity, and District 50 kicked in. They got a new contract, but wages were frozen for a year at prestrike rates. At Baton Rouge, La., District 50 lost again. This time the strike lasted from August 20 to September 22. The union got a new contract, but wages were reduced 5c. per hour for a 90 day period, and then were returned to prestrike figures. At Houston, Tex., CIO Oil Workers struck on August 23 after their contract ran out. The strike never officially ended, and the plant is operating at capacity without the Oil Workers.

Jefferson. At Jefferson Chemical Co.'s Port Neches, Tex., plant the CIO's Oil Workers struck on September 7, primarily over wages, although there were other issues involved. The union asked a 25-35c. wage boost (down from 30-65c. when negotiations began), contract clauses requiring negotiation on a 36-hour week at the union's option, and the right to negotiate with the company on how many operators a given unit required. The strike was settled on November 10 with an 18c. wage increase, a flat no strike clause in the contract. The union lost its last two demands completely.

Lever. AFL Chemical Workers struck for one day at Lever Bros.' Cambridge, Mass., plant over a system of pay ratings for some 40 employees. The 950 workers went out

on November 14 and returned the next day pending arbitration of the dispute.

PENSIONS

Bargaining Point

In collective bargaining, pensions became the big issue. They dominated John L. Lewis' running battle with the mine operators. They were the key to the steel strike. In the chemical process industries, too, pensions were a pivotal issue.

In the CPI there were pension plans by companies that previously had none—but more than that, there were changes in existing pension plans. In December, Du Pont announced that it was going to ask its stockholders for approval of a greatly increased plan, one that would guarantee a minimum of $100 a month (including federal old age benefit payments) to any eligible retiring worker.

Carbide & Carbon was considering changes, but had come to no definite proposal.

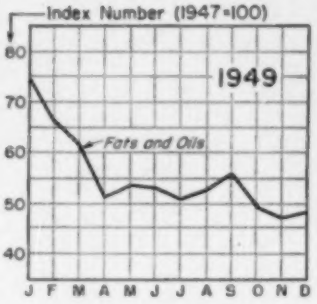
Atlas Powder will present changes to its stockholders this spring. At Tamaqua, Pa., Atlas signed a contract with two UMW locals agreeing to put the change up to its stockholders. If, by any chance, it is rejected, the union may open the contract to bargaining on pensions on thirty days notice.

Blockson Chemical Co. at Joliet, Ill., agreed with the AFL Chemical Workers on a pension scheme—different because it contains a "vested rights" provision. After 10 years service a worker can change jobs without losing benefits.

Wyandotte used to deduct full federal old age payments from its pensions. Under a contract signed with District 50 at its Wyandotte, Mich., plant, it will now deduct only that share of social security payments equivalent to the company's contribution. This change, incidentally, represents a common pension plan provision.

Other companies are grappling with the pension problem—particularly the rubber companies. At the end of the year, negotiators had been at the problem for more than four months, and seemed still far from agreement. As 1950 started, the Goodyear and Firestone unions authorized strike votes. Contracts are due to expire this month.

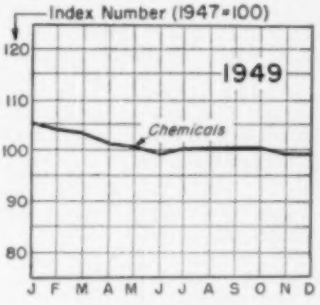
PRICES



OILS AND FATS

Slippery Going Here

Prices of fats and oils tumbled in 1949. After easing down from the 1947 peaks during 1948, prices really dropped in the recent 12-month interval. *Chemical Engineering's* index, above, shows the full extent of the break. With 1947 = 100, the year started with prices at 75.89 in January and by December the level had fallen to $47.93. This 36 percent dip in the index reflects the fall in support prices to farmers and a rising competition in the fats and oils markets. Dropping soap output and the growing use of synthetic detergents undoubtedly added their weight to the sagging price structure. Last year the shortage of most fats and oils had passed. The coming year will see more competition in this market—prices will reflect it.



CHEMICALS

Over the Top

Chemical prices reflected the sharp shift from a seller's to a buyer's market last year. By December *Chemical Engineering's* new price index had skidded downhill 11 points from December 1948. This was the direct result of the impact of competitive markets in all branches of the chemical industry.

First sharp blow was created by the slump in the solvent business (see *Supply and Demand*). As a result of the falling markets and a contract tying the price of molasses to ethyl alcohol, ethyl slipped to 20c. per gal. Other solvents fell with it. Fermentation butyl stumbled from 35 to 17½c. in one day. This was done to compete with the synthetic product which had been selling at 17½c. for some time. By the end of the year it was down to 12c. per lb. Acetone dropped from 8½ to 7½c. per lb. during the calendar year. Ethyl finally recovered some lost ground after alcohol producers began to wonder if they were going to have a shirt left at the close of 1949. At the start of this year the basic alcohol price was 29c. per gal.

The decline in molasses price put fermenters in a better position for normal butyl alcohol. It takes about a gallon of molasses to produce a pound of alcohol, so the reduction in molasses cut the cost of producing butyl. One large fermenter took considerable business away from a synthetic producer at a preferred price, but the synthetic producer could use the butanol himself so it made little attempt to keep the business. Prices dipped a little in the middle of the year and were expected to slip again in 1950.

A synthetic amyl producer, with production up, tried to recapture a place in the solvent market. Other types of synthetic amyls at lower prices made this comeback difficult.

There was a fair increase in the amount of cellosolve acetate, so the formulator had an ample selection of high boiling solvents to draw from during 1949. As the cost of all of these solvents is fairly high, price reductions were not large.

Pigment price drops added the second great blow to the price index. Lead pigments reflected the lower prices in the basic metal created by a slack demand and cheap foreign metal. White lead was typical—it fell from 22.10c. to 14.75c. per lb. during the year, with several fluctuations before the final results were tabulated. Zinc pigments followed the lead derivatives. Zinc oxide slipped from 15½c. to 11c. per lb. during the

year. Titanium dioxide, however, held its 19½c. per lb. price in spite of a switch to a buyer's market during the year.

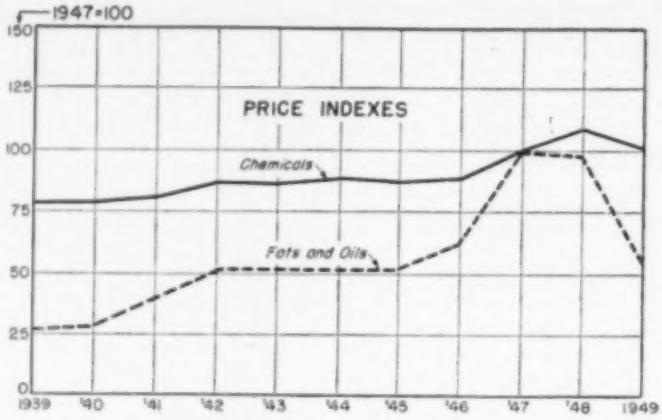
Industrial grades of phenol dropped off 1½c. per lb. during the year as this half of the phenol-formaldehyde team felt the arrival of more capacity and lower demand; some producers closed down during the year and purchased their requirements. Labor troubles also held back supplies. At the start of this year phenol ranged from 11c. to 12.5c. per lb. depending on the grade.

Acrolein prices were cut in half during the year as a major producers' bid to expand its use. It went from $1 to 50c. per lb. in one day.

Salt cake dug into its foxholes to defend itself in a slow market by reducing prices. In 1949 the price of this basic chemical dipped from $25 to $22 per ton. It faced the additional problem of a coproduct, HCl, which was finding the competition tough in 1949 (see *Supply and Demand*). The HCl produced in the Manheim furnaces found competition in the mushrooming byproduct acid yields from organic chlorination operations in the southern and eastern market areas.

	Cost of Common Chemicals C./Lb., 100% Basis
Acetic acid, glacial	7.5
Acetone	7.5
Aluminum sulphate	1.5
Ammonia, anhydrous	2.7
Ammonium sulphate	2.5
Aniline	14
Arsenic, white	6.5
Benzene	2.01
Butyl alcohol normal	12
Carbon bisulphide	4.4
Carbon tetrachloride	8
Caustic soda	3.05
Chlorine	2.4
Copper sulphate	7.25
Ethyl alcohol, SD1	4.7
Ethylene glycol	14.5
Formaldehyde	9.45
Hydrochloric acid, 18°	3.2
Methanol	3.94
Nitric acid, 36°	9.55
Phenol	11
Salt cake	1.1
Soda ash	1
Sodium bichromate	9.75
Sodium phosphate, tribasic	3.75
Sodium silicate	2.7
Sulphur, crude	0.9
Sulphuric acid, 60°	0.885
White Lead	14.74
Zinc oxide	11

PRICE LIST FOR ENGINEERS. If you purchase in large quantities, how much do chemicals cost? We've made this list not as prices are quoted but on the basis of cents per pound of contained chemical.



NEW PRICE INDEX

Shifting Weight

New 1947 Census data make it possible to give current price weightings for chemicals, oils and fats.

Chemical Engineering's price indexes of chemicals and oils and fats were revised last in 1937. Since that time many changes have taken place in chemicals and oil and fat industries. The recent release of data for 1947 has made it advisable to adopt the latest official figures as base figures for the new index. Internal changes in the chemical industry have affected the relative importance of many products and in some cases there have been downward price movements due to improved technology or to other circumstances, not tied into a general trend. These factors effect the products involved, and it becomes essential to take them into consideration in giving an accurate figure of the price status of the industry. In the present revision ethyl acetate has been dropped from the index. Acetone and ethylene glycol have been added. These chemicals were selected because their volume of output and their position in the industry gives a more equitable cross section.

To get the total volume of stocks for sale, it is necessary to add imports to domestic production. However, in some cases import figures are not included in the tabulations shown. This does not necessarily mean that there are none, but rather that such imports are too small to be given a place in the monthly summary of the Department of Commerce. Therefore, their inclusion or omission is not important in establishing the individual weighting.

After obtaining the data for the total supply of each individual chemical as well as its basic price, it is possible to get the total value figure for the index. After the values for all component parts of the index are computed they are added to get a grand total. To obtain the percent of total for an individual chemical, the value of the individual chemical is divided by the grand total to give the percent of total. With this data it is possible to compute the effect of a change in the basic price of any combination of chemicals, listed in the index.

Evidence of need for the revision of the oils and fats index is shown in the percent of total column. In 1937 cottonseed oil represented 29.94 percent of the total index. The second largest item on the index was linseed oil. In 1947 cottonseed oil had dropped to 19.5 percent of the total and soybean oil occupied the top position 23.97 percent of the total on the 1947 base year.

To keep *Chemical Engineering* readers up to date on the current price trend, *Chemical Engineering* will publish the revised indexes of chemical prices as well as oils and fats prices on the Price, Production, and Consumption Trends pages of each issue of the magazine. For both indexes, data will be shown for the current month, previous month, a year ago and two years ago.

Production data shown below in the tabulation of basic data were obtained from material published by the Bureau of the Census and the Tariff Commission.

PRODUCTION, PRICE AND VALUE OF OUR MOST IMPORTANT CHEMICALS

Basic Data for Chemical Engineering's Weighted Index of Chemical Prices

	PRODUCTION	IMPORTS	TOTAL SUPPLY	BASIC PRICE	VALUE	PERCENT OF TOTAL
Acetone, lb.	397,189,000	.....	397,189,000	$0.07	$27,803,230	1.77
Acid, acetic, 28%, lb. drum	1,294,511,000	37,853,000	1,332,264,000	0.0378	50,363,359	3.22
Acid, hydrochloric, 18°, ton, tanks	1,585,093	.....	1,585,093	19.41	30,766,655	1.96
Acid, nitric 36°, ton, carboys	2,275,317	.....	2,275,317	100.00	227,531,700	14.52
Acid, sulphuric, 60°, ton, tanks	12,304,940	31,024	12,335,954	12.875	158,825,408	10.14
Alcohol, butyl, lb., tanks, synthetic	256,096,000	.....	256,096,000	0.165	42,255,840	2.70
Alcohol, ethyl, gal., SD-1, tanks	187,904,000	21,501,173	209,405,173	90.5	189,511,682	12.10
Aluminum sulphate, lb., bg.	1,078,868,000	.....	1,078,868,000	0.0115	22,377,327	1.43
Ammonia, anhydrous, ton, tanks	1,114,000	.....	1,114,000	59.0	65,726,000	4.20
Ammonium sulphate, ton, bg.	809,440	114,598	924,038	31.67	29,264,283	1.87
Aniline oil, lb., tanks	107,027,000	.....	107,027,000	0.13	13,913,510	0.89
Arsenic, white, lb., drum	37,510,000	27,879,965	65,389,965	0.06	3,923,398	0.25
Benzene, gal., tanks, east	167,652,000	.....	167,652,000	0.1867	31,300,628	2.00
Borax, gran., ton., bg., cl.	308,542	.....	308,542	48.50	14,964,287	0.96
Calcium carbide, ton, bg.	607,113	.....	607,113	53.33	32,377,335	2.07
Carbon bisulphide, lb., drum	386,175,000	.....	386,175,000	0.0508	19,617,690	1.25
Carbon tetrachloride, tech., lb., drum	199,338,000	.....	199,338,000	0.0625	12,458,620	0.80
Chlorine, liquid, lb., tanks	2,586,438,000	.....	2,586,438,000	0.0205	59,271,979	3.78
Copper sulphate, lb., bg., cl., works	178,200,000	2,518	178,202,518	0.075	13,365,188	0.85
Ethylene glycol, lb., tanks	226,673,000	.....	226,673,000	0.11	24,934,030	1.59
Formaldehyde, 37%, lb., tanks	520,642,000	110,000	520,752,000	0.0357	18,590,864	1.19
Lithopone, lb., bg.	330,048,000	.....	330,048,000	0.05625	18,565,200	1.18
Methanol, synthetic, gal., tanks	83,722,000	.....	83,722,000	0.24	20,093,280	1.28
Phenol, lb., tanks	265,289,000	.....	265,289,000	0.111	29,447,079	1.88
Salt cake, tech. bbl., cl.	693,517	43,890	737,407	20.00	14,748,140	0.94
Soda, ash, 58%, light, bg., works, lb.	9,602,192,000	1,355,520	9,603,547,520	0.124	119,084,005	7.60
Soda, caustic, solid, drum, cl.	4,280,148,000	1,490,000	4,281,638,000	0.0258	110,466,260	7.05
Sodium bichromate, bg., cl.	180,570,000	.....	180,570,000	0.0833	15,041,481	0.96
Sodium phosphate, bg., cl.	177,136,000	242,531	179,378,531	0.0341	6,048,608	0.38
Sodium silicate, drum, works, lb.	985,674,000	204,000	985,878,000	0.0095	9,365,841	0.60
Sulphur, crude, ton, bulk	4,839,563	.....	4,839,563	16.00	77,433,008	4.94
Turpentine, gum, gal., drums	14,567,400	722,000	15,289,400	0.92	14,066,248	0.89
White lead, dry, lb. (20 ton carlots)	78,150,000	1,249	78,151,249	0.155	12,113,444	0.77
Zinc oxide, lead free, bg., cl.	321,542,000	236,106	321,778,106	0.097	31,212,476	1.99
					$1,585,051,753	100.00

PRODUCTION, PRICE AND VALUE OF OUR MOST IMPORTANT FATS & OILS

Basic Data for Chemical Engineering's Weighted Index of Fats and Oils Prices

	PRODUCTION (lb.)	IMPORTS (lb.)	TOTAL SUPPLY (lb.)	BASE PRICE (lb.)	VALUE	PERCENT OF TOTAL
Cottonseed oil, tanks	1,117,167,000	975,992	1,118,142,942	$0.2567	$287,023,293	19.87
Linseed oil, tanks	455,582,000	117,326,044	572,908,044	0.3333	190,950,251	13.02
Coconut oil, tanks	782,279,000	23,558,615	805,837,615	0.183	147,468,284	10.05
Corn oil, tanks	246,612,000	.....	246,612,000	0.259	63,872,508	4.36
Tung oil, tanks	12,580,000	121,564,269	134,244,269	0.295	39,602,089	2.71
Castor oil, tanks, No. 3	117,189,000	6,594,893	123,783,893	0.2875	35,587,899	2.43
Soybean oil, tanks	1,541,484,000	.....	1,541,484,000	0.228	351,458,352	23.97
Peanut oil, tanks	132,104,000	95,293	132,199,293	0.26	34,371,816	2.34
Palm oil, tanks	.....	63,212,469	63,212,469	0.17	10,746,120	0.73
Menhaden oil, tanks	63,550,283	.....	63,550,283	0.185	11,756,802	0.80
Tallow inedible, extra	1,118,298,000	1,083,642	1,119,381,642	0.183	204,846,840	13.97
Red oil, tanks	72,045,000	.....	72,045,000	0.24875	17,921,194	1.22
Oleo oil, tanks	52,385,000	.....	52,385,000	0.2425	12,703,363	0.87
Glycerine, soap lye	207,768,000	2,839,704	210,607,704	0.275	57,917,143	3.95
					$1,466,225,894	100.00

NEW PRICE INDEX CARRIED BACK TO 1939

Chemical Engineering's Weighted Index for Chemical Prices (1947 = 100)

	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949
January	79.60	79.45	80.80	87.81	87.65	90.20	87.72	88.10	97.83	106.15	105.09
February	79.10	79.62	80.40	87.82	87.63	89.70	87.73	88.10	97.90	106.41	104.19
March	78.62	79.56	80.40	87.82	87.62	90.68	87.74	88.10	98.39	107.28	102.79
April	78.46	79.40	80.60	88.21	87.61	89.69	87.73	88.10	100.53	108.98	102.03
May	78.30	79.42	80.80	88.15	87.62	89.49	87.74	88.10	100.05	108.26	101.38
June	78.10	79.36	80.96	88.14	87.81	89.54	87.73	88.10	100.06	109.47	99.90
July	78.08	79.37	80.61	88.08	87.82	89.56	87.49	88.28	100.00	111.00	100.48
August	78.00	79.40	82.30	87.82	87.82	89.57	87.53	88.28	99.72	110.93	100.54
September	78.15	79.41	83.25	88.01	87.82	89.42	87.53	88.28	100.04	110.36	100.57
October	78.50	80.01	83.80	88.01	87.85	89.45	87.55	88.28	100.08	110.49	100.42
November	78.62	80.08	83.65	87.70	88.21	88.04	87.37	95.47	102.80	112.30	99.37
December	79.41	80.10	83.60	87.69	88.20	88.04	88.13	95.98	102.51	110.48	99.34
Average	78.52	79.60	81.75	87.94	87.80	89.36	87.69	88.81	100.00	109.36	101.33

Chemical Engineering's Weighted Index for Prices of Fats and Oils (1947 = 100)

	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949
January	26.46	27.58	27.43	49.78	49.73	50.41	50.86	50.63	113.26	110.51	75.89
February	24.86	30.00	27.80	50.75	49.96	50.41	50.82	50.81	118.72	110.74	65.48
March	25.81	29.70	29.32	51.55	49.96	50.41	50.82	50.90	127.03	99.94	62.16
April	24.89	28.42	34.12	52.41	49.96	50.41	50.82	50.90	118.93	97.95	51.28
May	25.81	28.75	39.64	52.42	50.58	50.30	51.11	50.90	93.09	108.32	53.53
June	25.91	26.71	40.83	52.25	50.47	50.30	51.11	50.90	82.42	111.46	52.74
July	25.62	26.70	42.90	52.15	50.48	50.30	51.11	54.81	79.42	108.53	50.79
August	25.09	24.90	44.75	51.45	50.48	50.30	51.11	54.86	78.53	96.86	52.25
September	30.71	24.58	46.79	51.40	50.48	49.94	51.10	51.77	76.97	93.55	55.49
October	29.93	24.39	49.26	51.30	50.48	49.99	51.10	56.59	96.76	85.74	48.97
November	29.41	25.08	47.49	51.10	50.40	50.09	51.10	104.21	102.05	86.38	47.25
December	28.89	25.28	47.39	51.35	50.40	50.09	51.10	112.38	115.81	86.29	47.93
Average	27.09	27.63	39.84	51.80	50.28	50.22	50.99	61.61	100.00	99.25	55.31

SIZE & SHAPE OF THE INDUSTRY—1947 CENSUS

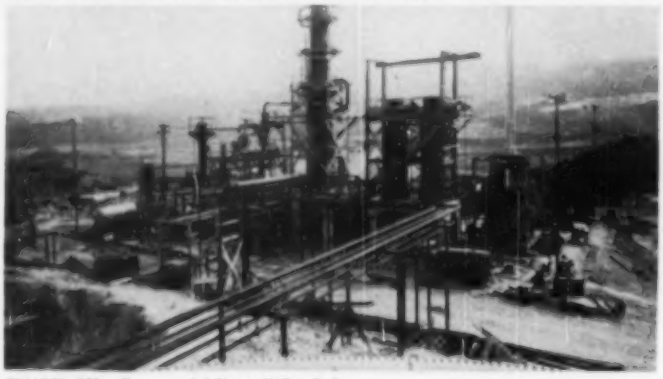
Statisticians in the chemical process industries will remember 1949 as the year of the Big Know. All during 1948 Census Department legmen and questionnaires had been counting industry's noses: How many plants? pounds? people? Your expenditures for labor? materials? equipment? Your take in sales? Commerce Department adding machines began to chew their way through the mountain of numbers turned in by census. By midsummer the long columns of figures began to form a picture. For example (bottom of first two columns) our plants had increased in number to 18,000—up almost 20 percent above 1939, the last census year. Sales (next-to-last pair of columns) jumped to $35 billion—up more than 200 percent. (Corollary: 1947's chemical plant was a whale of a lot bigger than 1939's.) That fat new war baby—synthetic-rubber—bounced up out of nowhere during the war. Now it towers over the soap, medicinal chemicals and explosives industries. Over on the last two columns (plant expenditures) is the measure of virility of our industries. Here petroleum refining and organic chemicals show up as top dog. The $41 million miscellaneous plant figure is accounted for by industries such as fireworks, baking powders, batteries, sewer pipe and corn sirup.

	Number of Plants		Number of Employees		Value Added by Mfg.		Cost of Mat'ls., Fuels, etc.		Value of Shipments		Plant Expenditures	
	1939	1947	1939	1947	1939	1947	1939	1947	1939	1947	New 1947	Used 1947
Chemicals												
Alkalis	33	32	.....	19,853	$68,204	$113,868	$33,653	$94,692	$101,857	$208,560	$56,404	$420
Inorganic, nec	207	380	.....	45,494	165,514	340,831	136,656	331,814	302,170	672,645	65,324	4,967
Organic, nec	192	258	.....	85,015	291,721	714,030	163,769	731,180	376,586	1,445,210	258,677	49,201
Plastics materials	41	125	.....	29,337	39,742	300,341	43,582	283,130	83,324	583,461	58,386	6,765
Synthetic rubber	....	20	.....	7,663	97,356	137,844	.....	137,844	.....	335,200	4,121	466
Chemical products, nec	814	1,174	.....	22,153	53,373	193,436	46,837	199,806	109,210	393,242	15,225	1,496
Coal-tar products	45	46	.....	1,972	11,433	17,071	21,368	43,568	32,801	60,639	1,981	17
Compressed & liq. gases	379	371	6,450	8,983	39,833	66,833	13,532	26,656	53,365	93,489	9,709	3,815
Insecticides & fungicides	83	166	.....	4,579	3,825	30,121	5,348	42,947	9,173	73,068	3,436	177
Salt	40	38	4,555	4,809	17,961	25,197	9,569	20,850	27,530	46,056	4,181	29
Tanning materials	35	29	.....	1,382	6,252	6,777	6,019	11,567	12,271	18,344	266	55
Gum naval stores	755	31	1,892	638	3,966	2,634	13,396	36,397	17,362	38,508	336	371
Softwood naval stores	25	32	2,924	4,574	7,590	46,064	6,524	26,935	14,114	72,999	2,486	43
Hardwood naval stores	43	27	2,091	1,872	2,915	7,490	3,928	6,235	6,843	13,725	608	22
Synthetic fibers	30	38	55,471	71,882	168,606	447,877	78,460	262,615	247,066	705,271	67,953	1,305
Coke-oven products												
Beehive coke	29	78	761	3,100	1,214	21,661	3,567	48,576	4,781	70,237	376	13
Coke-oven byproducts	83	89	24,000	35,838	84,547	256,569	257,650	714,065	970,634	942,197	63,887	5,036
Drugs & Medicines												
Biological products	80	85	.....	3,154	12,046	19,941	7,403	18,811	19,449	38,752	1,360	5
Botanical products	15	17	.....	709	4,389	9,009	3,280	7,398	7,669	16,395	650	.....
Medicinal chemicals	20	92	.....	12,388	10,701	110,516	10,314	91,245	21,015	201,761	13,540	355
Pharmaceuticals	1,000	1,165	.....	65,552	233,513	609,104	104,711	332,609	338,224	941,713	59,405	1,530
Toilet prep	539	719	15,614	26,023	28,956	226,872	58,510	145,030	147,466	371,892	9,192	3,977
Explosives	80	76	8,315	10,426	44,706	74,708	26,860	61,639	71,053	136,356	6,060	286
Fertilizers	171	187	.....	20,371	32,172	126,856	68,117	197,049	160,289	311,657	10,823	321
Glass and Ceramics												
Flat glass	37	34	18,638	27,241	68,540	173,754	33,849	68,818	102,389	242,805	11,618	27
Glass containers	77	87	29,357	47,132	98,378	252,069	59,894	191,961	158,272	422,614	32,775	1,187
Glassware, nec	115	126	31,320	42,170	70,284	167,449	27,033	69,883	97,317	234,795	16,321	211
Clay products, nec	127	161	3,891	5,745	7,273	23,871	2,177	6,757	9,450	28,814	2,031	674
Clay refractories	165	169	13,655	17,978	38,978	76,054	13,213	35,296	42,191	109,389	5,875	328
Pottery & related products	266	677	36,586	56,958	68,742	219,649	27,808	75,105	96,550	294,754	15,858	619
Sand-lime products	27	26	429	303	1,278	1,186	638	544	1,916	1,730	171	10
Brick & hollow tile	800	674	32,962	29,617	55,584	110,867	22,469	37,040	78,153	144,497	13,366	772
Leather, tanned	446	561	51,562	53,205	117,394	403,783	229,044	666,308	346,438	1,070,085	10,565	386

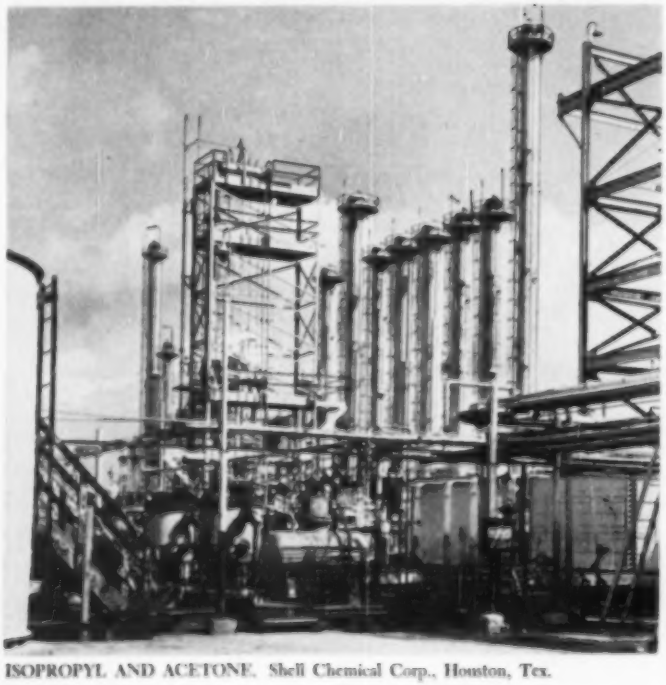
Lime	316	172	.....	7,009	18,574	39,253	24,901	33,589	43,475	72,842	10,745	530
Cement (excl. quarries)	160	155	24,539	35,662	115,209	247,936	77,402	160,992	192,611	408,928	42,488	1,449
Oils and fats												
Cooking & other edible, nec	82	100	.....	8,003	33,131	162,146	158,742	737,405	191,873	884,713	7,216	344
Cottonseed oil, cake & meal	447	315	18,519	14,398	32,712	104,603	138,764	413,488	171,476	518,091	9,804	454
Linseed oil, cake & meal	25	17	2,388	1,577	11,556	42,243	56,456	149,930	68,012	192,173	5,086	42
Soybean oil, cake & meal	47	133	2,010	6,460	9,512	105,291	34,435	480,418	43,947	585,709	15,887	262
Veg. oil mills, nec	38	84	.....	5,036	3,681	77,509	15,541	256,722	19,222	334,231	5,252	460
Marine animal oils	81	59	.....	1,947	6,212	15,033	13,953	16,232	20,165	31,262	1,688	100
Grease & tallow	310	556	6,536	12,472	20,111	118,830	38,115	187,521	58,226	304,535	12,611	555
Fatty acids	9	16	.....	1,335	2,813	17,151	6,650	50,943	9,463	68,094	1,427	58
Animal oils, nec	5	14	.....	206	188	1,816	555	9,859	743	11,675	61	1
Essential oils	15	42	.....	1,151	4,921	14,477	7,401	21,262	12,322	35,739	593	8
Paints, varnishes, pigments & allied products												
Paints and varnishes	1,125	1,291	n. a.	53,412	185,723	469,584	241,366	779,257	427,089	1,248,841	35,884	1,604
Inorganic color pigments	59	94	n. a.	13,140	38,373	94,658	41,014	175,312	79,387	269,970	19,329	85
Whiting and fillers	41	71	n. a.	1,255	1,722	8,995	1,994	9,796	3,716	18,719	311	68
Paper, pulp and board												
Pulp mills	194	226	30,613	50,290	82,115	415,938	144,737	523,666	226,852	939,604	85,507	3,846
Paper & board mills incl. building paper & board	....	695	.....	148,080	.....	1,050,108	.....	1,761,940	.....	2,812,048	205,019	4,994
Paper coating & glazing	....	182	.....	18,133	.....	126,840	.....	225,497	.....	352,337	10,072	2,027
Petroleum												
Petroleum refining	518	437	.....	145,806	528,575	1,494,474	1,933,921	5,129,234	2,462,496	6,623,708	316,370	34,105
Lubricants, nec	199	233	.....	6,271	19,414	69,435	28,274	105,566	47,688	175,001	3,168	250
Petroleum & coke, nec	....	14	.....	521	.....	8,420	.....	6,471	.....	15,161	133	26
Rubber products												
Tires & inner tubes	53	57	67,169	115,557	231,372	650,165	349,557	944,215	580,929	1,547,040	54,883	4,683
Rubber, footwear	13	26	13,098	28,125	29,231	121,040	20,750	80,607	49,981	198,691	4,982	169
Reclaimed rubber	10	15	1,282	2,070	3,902	9,604	2,992	8,049	6,894	17,263	2,864	22
Rubber industries, nec	519	777	63,189	113,240	141,650	522,054	122,875	441,234	264,525	953,453	47,054	2,427
Soap, glycerine, cleaning, polishing & related products												
Soap and glycerine	264	249	20,191	27,660	141,632	450,721	161,002	640,424	302,634	1,085,789	24,089	569
Cleaning and polishing preparations	637	1,038	9,978	15,352	52,097	135,120	37,670	126,854	89,767	261,565	9,655	995
Sulphonated oils & assistants	85	105	n. a.	1,950	7,259	20,238	10,504	31,268	17,163	51,506	1,390	119
Other chemical process industries												
Beet sugar	85	74	12,324	13,412	49,000	118,048	68,000	187,485	117,000	262,872	12,520	195
Boneblack, carbonblack and lampblack	53	59	1,909	3,184	8,523	44,962	6,104	28,345	14,627	73,592	7,023	601
Cane sugar refining	27	25	16,828	17,376	56,000	98,112	289,000	728,744	345,000	818,430	5,902	690
Dyeing and finishing textiles (except wool)	468	641	68,460	77,985	130,695	359,270	n. a.	172,130	n. a.	531,400	29,658	1,047
Dyeing wool	63	59	4,511	5,802	10,484	22,084	n. a.	6,805	n. a.	22,889	929	7
Artificial leather & oilcloth	92	110	n. a.	8,698	28,273	51,209	34,929	105,935	63,202	157,114	3,997	165
Fuel briquettes	32	99	494	1,204	1,716	9,093	3,571	23,769	5,287	32,862	686	26
Glue and gelatine	80	72	3,973	5,372	15,538	45,346	18,794	54,327	34,332	99,262	3,249	28
Natural graphite refined, blended	6	12	88	853	399	4,945	852	4,051	1,251	8,996	366	none
Gypsum products	68	73	5,863	7,472	29,548	67,879	16,694	59,054	46,242	127,543	24,386	424
Ink, printing	197	239	n. a.	6,021	23,238	51,949	23,955	63,759	47,243	115,708	2,973	332
Linoleum & asphalt base flooring	17	19	8,301	10,000	41,506	83,282	28,369	93,535	69,875	174,736	8,708	300
Distilled liquors except brandy	236	226	n. a.	30,422	n. a.	472,357	n. a.	397,878	n. a.	870,235	22,903	3,468
Matches	28	29	5,940	7,350	11,479	31,302	14,098	25,355	25,577	56,657	2,748	12
Minerals & earths	223	206	n. a.	7,955	23,046	51,058	13,644	30,444	36,690	81,502	8,414	338
Paving mixtures & blocks	231	263	3,193	2,684	13,728	22,803	19,026	27,384	32,754	50,187	2,924	168
Roofing felts & coatings	135	174	n. a.	16,579	48,079	132,852	62,359	205,625	110,438	338,477	12,210	143
Wood preserving	216	242	12,623	16,247	28,818	92,041	77,477	211,916	106,295	393,957	6,243	780
Miscellaneous	1,031	671	n. a.	69,365	300,613	613,736	717,332	658,613	658,001	1,725,180	40,179	1,344
TOTAL	15,441	15,153	n. a.	1,912,315	$4,499,454	$14,000,240	$8,602,944	$21,607,417	$11,102,398	$35,411,130	$1,930,449	$154,968

Source: 1947 Census of Manufactures; all money in thousands of dollars. n. a.—not available nec.—not elsewhere classified.

COAL HYDROGENATION. Bureau of Mines, Louisiana, Mo.



SHALE OIL. Bureau of Mines, Rifle, Colo.



ISOPROPYL AND ACETONE. Shell Chemical Corp., Houston, Tex.

YEAR IN RETROSPECT

Progress to Report

Recession or no recession, 1949 was a year of substantial advance along the whole broad front of process industries. A good deal of drag was imposed on progress by high construction costs and last spring's sour economic outlook, but a look at the record belies any suspicion that either process industries or chemical engineering profession proposed to stagnate. Much expansion, of course, was completed in 1948, but a very fair amount was left over for 1949 and the future.

It is hard to single out the areas of greatest development and most striking portent. Perhaps these should include chemicals from coal, shale, natural gas and petroleum; acetylene chemistry; Fischer-Tropsch and Oxo processes; cold rubber, antibiotics and synthetic fibers; tonnage oxygen, silicon and fluorine chemicals, titanium metal and its compounds. Important advances, too, are evident among the unit operations and process equipment. Most of these have been covered at length in our November issue (*Chem. Eng.*, Nov. 1949, pp. 103-9), or subsequently.

FUELS OF THE FUTURE

Pressure Off?

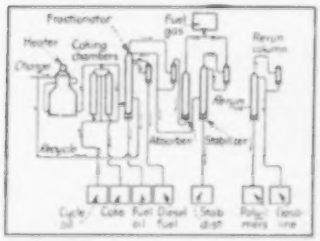
What to do about future fuel requirements, particularly if World War III should come, has been agitating both government and industry. Most of the petroleum industry has switched to the belief that the problem can be postponed, since there is still a lot of petroleum in the ground. Furthermore, Canada's recently discovered and still undiscovered oil fields may increase the Continent's potential far beyond present proved reserves. Nevertheless, one commercial Fischer-Tropsch plant, to operate on natural gas—that of Carthage Hydrocol at Brownsville, Tex.—will be on stream within a few months. The Bureau of Mines at its Louisiana, Mo., pilot plant has already operated its coal-based synthesis gas plant successfully and expects to be ready with its hydrocarbon synthesis and product refining sections later this year. Against these are cut-backs in the program: Stanolind's postponement of its $80-million

Garden City fuels-from-gas program and Pittsburgh Consolidation's recent decision to drop the fuel-from-coal development at its Library, Pa., pilot plant. Meanwhile, under government retainer, Ford, Bacon & Davis is making a careful nation-wide survey to determine just where future synthesis plants can be placed most effectively.

Coal Hydrogenation

The second possible route from plentiful raw materials to liquid fuels is coal hydrogenation, long of interest both in England and Germany. U. S. Bureau of Mines has been considering the process for many years, but industry has been profoundly uninterested until recently. Now the Bureau of Mines has started operation of its coal hydrogenation demonstration plant at Louisiana, Mo., and it is commencing experiments also on a likely looking process from dry fluidized hydrogenation which resembles nothing previously attempted in this field. Industry, too, has been perking up its ears, interested chiefly in chemicals from coal.

Although the initial experiments with underground coal gasification carried out in Alabama in 1947 by Bureau of Mines and Alabama Power Co. were not particularly encouraging, new experiments were initiated by the bureau last year under circumstances which should avoid leakage and give better control and higher Btu. gas. This, together with certain industrial efforts in underground gasification, suggests that un-mined coal is going to get a thorough going over as a chemical raw material. Perhaps this will give the boss of United Mine Workers something to think about.



Shale Oil

With shale oil resources estimated at four or five times the Nation's petroleum reserves, both industry and government have been pursuing the shale oil will-o'-the-wisp, with good prospects of overtaking it. Shale oil differs markedly from crude petroleum and—on the surface—appears not too attractive from a fuel standpoint. Still, there seems to be a good chance that by recycle cracking and coking of residual products, high fuel yields will be obtained. At least, so think the Bureau of Mines and the several petroleum industry members who are cooperating in the oil shale program. The bureau has proved in low shale mining costs—50 to 60c. per ton—at the Rifle, Colo., demonstration plant; has developed an encouraging cross-flow retort; and has put on stream the country's first successful continuous shale oil refinery.

Industry cooperators include Standard Oil Development Co., working on a fluidizing method of retorting at Baton Rouge; and Union Oil Co., at Wilmington, Calif., which is experimenting with a mechanical retort. Although shale oil is probably a long time in the future as a large-scale commercial proposition, as a reserve for liquid fuels it probably ranks lower in the cost scale than fuels-from-coal.

CHEMICALS WITH FUEL

Industry Bait

Much of the current interest in natural gas, petroleum byproduct gases, coal and shale stems from chemicals, rather than fuels. Unlimited possibilities for organic chemical synthesis lie in all these raw materials. In a dozen years a petrochemical industry of enormous implications has developed. Organics too numerous to mention have changed or are seeking to change from their former raw material sources to those of the petrochemical group. Controlled oxidation of hydrocarbons, the Oxo process, "Reppe Chemie," olefins from paraffins, all have become ideas to conjure with.

Oxo Contagion

At least eight companies are excitedly eyeing the Oxo process, in which reaction of an olefin with carbon monoxide and hydrogen lengthens the hydrocarbon chain by one carbon atom and leads to such lusty offspring as aldehydes and higher alcohols, as well as their derivatives. The eight: Esso Standard, Indiana Standard, Oronite, Texas Co., Shell, Rohm & Haas, Du Pont and Tennessee Eastman. For some of these, Oxo chemicals are more than just gleams in their eyes. Three have actually started production, two in revamped units and one in a new pilot plant. Another has construction under way on a plant that will employ the process.

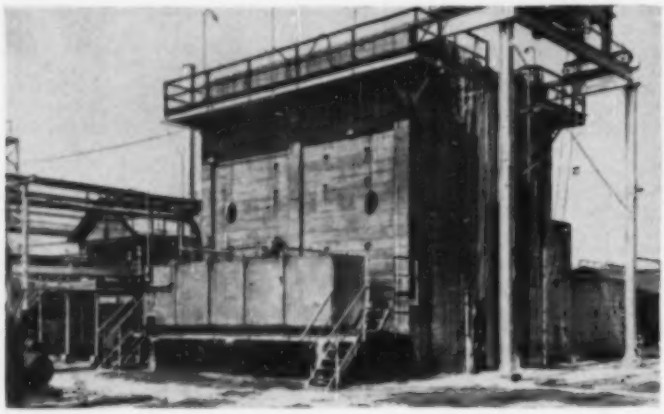
First into the field was Esso Standard, which was producing iso-octyl alcohol at Baton Rouge, La., in a high-pressure (3,000 psi.) hydrogenation unit that it redesigned for the purpose, as 1949 began.

Indiana Standard played it smart. Early in 1949, blaming high construction costs, it temporarily shelved plans to revamp high-pressure equipment at its Whiting, Ind., refinery for production of nonyl alcohol by the Oxo process. Thus it could wait and see how the others made out.

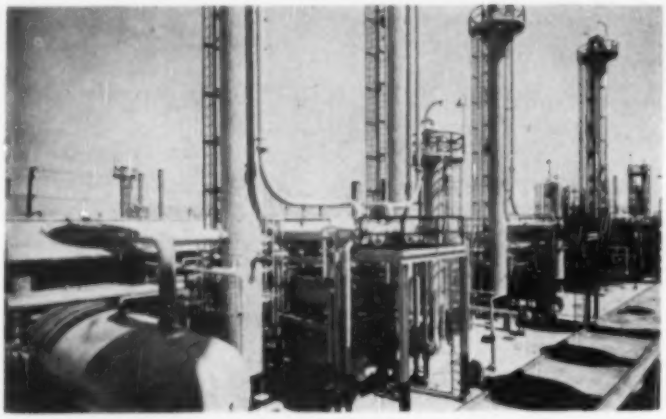
Also early in 1949, Rohm & Haas started up a pilot plant near Philadelphia to synthesize a whole raft of organics by the Oxo process. From diisobutylene, carbon monoxide and hydrogen, Rohm & Haas gets nonyl aldehyde, makes six new chemicals from it. Right now Rohm & Haas is exploring the markets for these, may later build a commercial plant, perhaps at the company's Texas site, where a host of acids, aldehydes and amines could be made from olefin hydrocarbons.

Du Pont, too, starts with diisobutylene, makes an aldehyde from it, then hydrogenates the aldehyde to the alcohol. To do this a unit at Belle, W. Va., has been modified. Tank cars of the alcohol, trimethyl hexanol, began highballing from there in the spring of 1949. Bulk of it will be esterified and find its way into plasticizers.

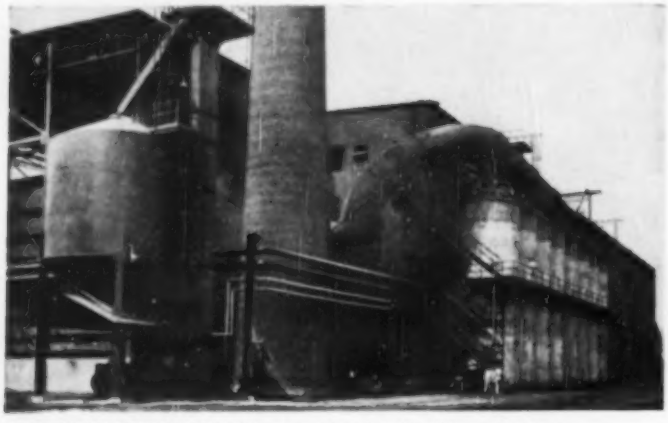
Latest entry into this fast-moving Oxo field is Tennessee Eastman. As 1950 began, Tennessee Eastman was just starting construction of a whopping plant on a 2,500-acre site near Longview, Tex., where abundant oil and natural gas are on tap. First chemical to come from this plant when it gets going in 1951 will be butyric acid. And it will be made by a modified high-pressure Oxo synthesis. The butyric will be used at Kingsport, Tenn., to make cellulose butyrate plastics. Other chemicals, now under wraps, are to come from the $10 million Longview plant. Could propionic acid be one? To those in the industry, it seems likely.



OXO. Esso Standard Oil Co., Baton Rouge, La.



GLYCERINE. Shell Chemical Corp., Houston, Tex.



FLUORINE SCRUBBERS. Monsanto Chemical Co., Monsanto, Tenn.

Acetylene Chemistry

Although we have long had a respectible acetylene industry, economic factors have been such that nothing like the German dependence on acetylene has existed in the United States. Whether this situation has changed or not, "Reppe Chemie" invaded the country last spring through a new pilot plant installed by General Aniline at Grasselli, N. J. This plant is using Walter Reppe's techniques, exploring acetylene reactions at higher temperatures and pressures than have formerly been used here. Vinylation of alcohols, mercaptans, amines, and higher fatty acids is on the program, together with ethynylation of aldehydes such as formaldehyde, to yield vinyl ethers such as butynediol, for adhesives and the plastics industry.

Elsewhere we continue to produce and consume acetylene in tremendous quantities to make acetylene black, acetaldehyde, acetic acid, anhydride, and acetates, trichloroethylene, neoprene, vinyl compounds, vinyl plastics and synthetic fibers of the Vinyon type. So, the search for cheaper acetylene sources goes on. Calcium carbide may yet have to give ground to a natural gas, process. Presumably, the process would treat methane in natural gas by partial combustion with oxygen to reach the necessary high temperature. I. G. Farben used such a process on a pilot plant scale, with estimated costs that are favorable in comparison with other acetylene sources. Furthermore, similar processes can be used for ethylene and propylene from ethane and propane. Still, this last process may not be able to compete with present thermal ethylene manufacturing methods now used in petrochemical operations.

CRACKERS

In Moving Beds

One of the last named ethylene production methods is the Thermofor pyrolytic cracking process announced in latter 1948 by Socony-Vacuum Oil Co. The process uses a moving-bed pebble heater to crack ethane or liquid hydrocarbon charge stocks, such as crudes, reduced crudes or distillates. At relatively low temperatures high ethylene yields are obtained, together with substantial output of aromatics.

During 1948 Houdry Process Corp. introduced a modification of Socony-Vacuum's Thermofor cat cracker to

which the name Houdriflow was given. A moving bed process which uses a gas lift to elevate and return the catalyst to the reactor after regeneration, the Houdriflow represents a considerable simplification over its progenitor. Furthermore, it saves space and something like 20 percent in investment. Brought out as Houdry's answer to the fluid cat cracker, Houdriflow units were installed or contracted for last year in at least five refineries from Coast to Coast. However, fluid cat crackers continued to go in—including the world's largest which was dedicated in October at Esso Standard's Bayway refinery.

Liquefied petroleum gases now going extensively into gas plant use have benefitted in the last two years from new reforming processes. These make gases suitable for pipeline distribution and help gas companies solve their peak load problems. Surface Combustion Corp.'s process cracks propane or butane catalytically with air and steam to produce a blue-gas-like mixture that mixes well with coke oven gas and is easily cold-enriched by addition of hydrocarbon vapor. The first installation, in 1948 at Riverhead, L. I., was followed by a larger installation at Harrisburg, Pa. Later, Universal Oil Products developed its Autothermic gas cracking process which reforms propane and other volatile hydrocarbons, either for similar gas company use, or for cracking ethane to ethylene for petrochemical manufacture. The process is said to be simple and compact, involving separate heating of hydrocarbon and air streams which are then mixed and reacted in a small reaction vessel. The reformed gas, containing nitrogen, is cooled by heat exchange, obtaining something like 98 percent over-all thermal efficiency.

SOUTHWEST

New Outlook

Having been through an exceptionally active postwar period, southwest chemical industry now enters a more normal period of development.

Desirable circumstances are accompanying the slow-down in construction. No longer is there a rush to get a plant built and in operation to the extent of omitting semi-commercial and pilot plant operations. Now management is much more prone to wait for results of economic surveys and engineering studies. Building costs have leveled off. There is more competition among contractors and builders, and labor efficiency has increased.

The chemical industry along the Gulf Coast thus far has produced intermediates. It is generally believed that the next phase of any building program in the industry will be concerned with plants for the conversion of these intermediates into consumer goods.

There is increased interest in the Southwest in anhydrous ammonia for fertilizing such crops as rice, sugar cane, and cotton.

During 1949 ammonia plants at Eldorado, Ark. (Lion Oil Co.), Houston, Tex. (San Jacinto Ordnance Works), and Etta, Tex. (Phillips Chemical Co.) were completed.

Ammonia plants due to be completed in 1950: American Vegetable Oil Ass'n. (Clarksdale, Miss.), Dow Chemical Co. (Freeport, Tex.), and Mississippi Chemical Corp. (Yazoo City, Miss.).

Whoppers

The new $42 million lubricating oil plant of Cit-Con Oil Corp. at Lake Charles, La. started operations in December. The furfural and Duo-Sol solvent refining units are the largest of their type ever built.

Completed in 1949: McCarthy Chemical Corp.'s $15 million plant for chemicals from natural gas at Winnie, Tex., $50 million rebuilding of Monsanto's Texas City plant, and the $45 million expansion at Baton Rouge, La. by Ethyl Corp.

Due to be completed in 1950 are the $50 million Carthage Hydrocol plant at Brownsville, Tex. and the $25 million Du Pont nylon chemicals plant, Victoria, Tex.

Open Construction

The Corn Products Refining Co.'s plant at Corpus Christi, Tex., is outstanding from the viewpoint of the type of construction. It has created more interest on the part of those engineers concerned with modern plant design than any plant built in recent years. It has been said that the buildings could hardly be called by that term at all. They look more like machines and that is what they are. This plant is the last word in a trend that started in the Southwest and spread to all parts of the country. The open type of construction can be seen at its best. It is likely to have an influence on future chemical plant design, especially along the Gulf Coast.

WEST COAST

Significant

A major development in the organic chemicals field was the construction by Dow Chemical Co. at Pittsburg, Calif., of the world's first commercial scale unit for the manufacture of synthetic methionine, an essential amino acid. This development is expected to lead to wider use of this product as a supplement for foods and perhaps to the large-scale synthesis of other important amino acids.

Another western "first" was the construction of Carborundum Co.'s, $2 million plant at Vancouver, Wash., for the manufacture of silicon carbide.

The largest disclosed project, dollar-wise, in the West for 1950 is Lever Bros.' $25 million soap and oil products plant near Los Angeles. The first manufacturing units of this project may be completed late in the year.

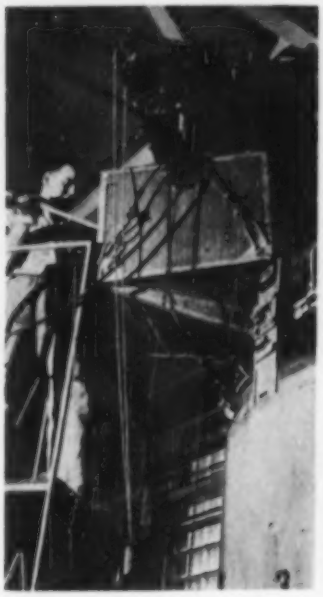
Already in the adhesives business at Seattle, Wash., Monsanto Chemical Co. has decided to expand its operations southward, and plans to complete this year a $500,000 plant at Santa Clara, Calif. to make synthetic bonding resins and coatings.

Ethylene glycol, widely used antifreeze agent with other commercial applications, may be produced for the first time commercially in the West this year by Hancock Chemical Co. in the Los Angeles area. The company has authorized E. B. Badger Sons Co. to make an engineering study of the project.

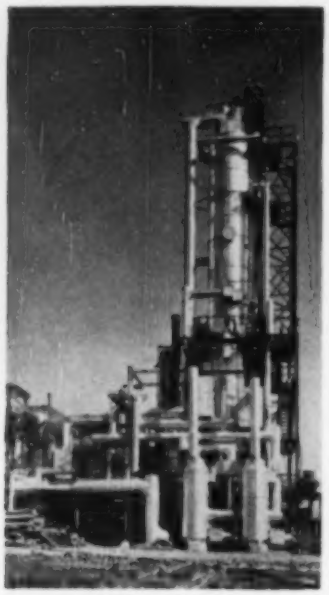
One of the most noteworthy projects slated for completion this year is the unit which Oronite Chemical Co. is building in its Richmond, Calif. plant to manufacture para-xylene for the first time on a commercial scale from petroleum raw materials. The product will be separated from a mixture by a low-temperature fractional crystallization method evolved by the company.

Among the major new projects completed during 1949 was the new kraft pulp and paper mill of Weyerhaeuser Timber Co. at Springfield, Ore., a plant designed with special emphasis on minimizing stream pollution, using the magnesia-base pulping process.

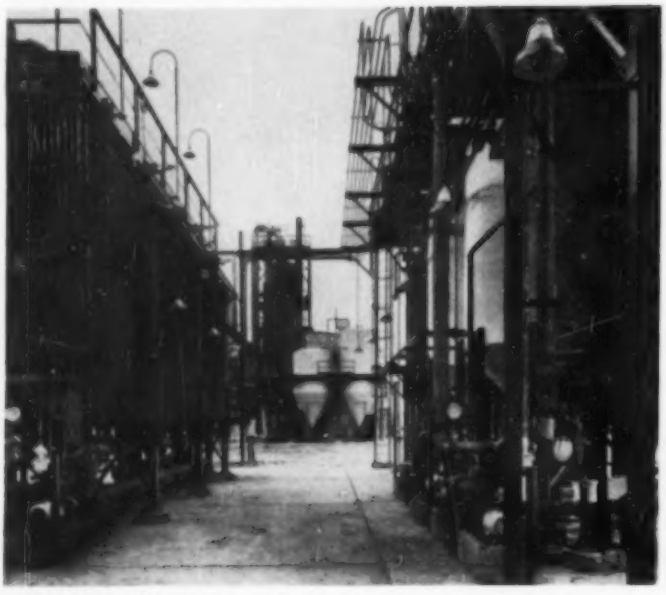
American Potash and Chemical Co.



SYNTHETIC CHLOROMYCETIN
Parke, Davis & Co.
Detroit, Mich.



TONNAGE OXYGEN
McCarthy Chemical Co.
Winnie, Tex.



HYDROGEN CYANIDE. Rohm & Haas, Houston, Tex.

put into operation a multi-million expansion at Trona, Cal. to increase its annual capacity for the production of soda ash by 60,000 tons, as well as an increase of 30,000 tons of borax.

Fertilizers Active

Fertilizers continued to be one of the leaders in western chemical enterprise during 1949, reflecting the heavy postwar growth in demand for fertilizers, particularly in California.

Superphosphates—Anaconda Copper Mining Co. at Anaconda, Mont., upped its triple-superphosphate capacity 40,000 tons yearly, while Gates Bros. at Wendell, Idaho, completed a new plant for superphosphate. Stauffer Chemical Co. will produce 35,000 tons of superphosphate yearly at its nearly-completed Tacoma, Wash., plant.

Potash—Potash Co. of America at Carlsbad, N. M. has jumped its muriate of potash 25 percent and its potassium chloride (chemical grade) 50 percent, and is pushing facilities for potassium sulphate. U. S. Potash Co. has also increased its capacity for the chemical grade potassium chloride (about one-fourth).

Ammonium Sulphate—Hercules Powder Co. at its plant near San Francisco, and Simplot Fertilizer Co. at Salt Lake City both began producing ammonium sulphate during 1949. Kaiser Steel Corp.'s Fontana, Calif., plant is responsible for a significant increase in ammonium sulphate production by virtue of the ammonia from 49 additional byproduct coke ovens installed last fall (equivalent sulphate—7 million pounds yearly).

TRIALS & ERRORS

Magnesium Bisulphite Pulping

Following close on the 1948 announcement of plant scale ammonia pulping for rayon grade pulps (a development of Rayonier at Sheldon, Wash.), came the disclosure that Weyerhaeuser, cooperating with Babcock & Wilcox and Howard Smith Paper Mills, was installing the world's first magnesium oxide pulping process at Longview, Wash. The plant first started late in 1948 and hit full production by mid-1949, but with this reservation: its chemical recovery, which was its reason for being, was considerably below par. Other sulphite producers, much interested in the prospect of solving their waste disposal

problems, decided to wait and see. Meanwhile, the process is recovering some 75 percent of its MgO and 65 percent of its sulphur, but trade opinion feels that this is far below the anticipated figures of 90-95 percent and 80 percent respectively.

Here is the aim: customarily sulphite mills—as distinct from soda and sulphate mills which have cyclic recovery processes—are great stream polluters. Magnesium bisulphite cooking liquor from Weyerhaeuser's new process can be concentrated, burned and the MgO slurried in water to catch the SO_2 leaving the furnace. Thus organics eliminated from the pulp provide process heat, while MgO and SO_2 return to the process except for the (theoretically) small losses.

Hardwood Pulping

Wood pulp production in recent years has been lagging behind the needs of synthetic fibers and cellophane industries. This fact is the catalyst for the many announcements of projected new dissolving pulp mills within the last two years. Most unusual of these is the $20 million mill now being built at Natchez, Miss., by International Paper Co. The process is to be sulphate or kraft, rather than the conventional sulphite process used for high-alpha pulps. Still more unusual, it will be the first to use hard, rather than soft woods. When it operates this year, the plant is expected to turn out over 100,000 tons per year, or about a sixth of present supply.

Hargreaves Again?

Years ago, sodium sulphate was largely the product of the reaction between salt, SO_2, air and steam, according to the Hargreaves-Robinson process. Except for Bay Chemical which has used this process successfully at Weeks Island, La., nothing of the sort has been seen in the U. S. for many years. Now rumor has it that history again will repeat—that Potash Co. of America's new potassium sulphate HCl plant hear Carlsbad, N. M., will use a Hargreaves modification, substituting KCl for NaCl.

Gas Storage

Now that natural gas pipelines are extending their tentacles all over the country, and the peak load problem has come uppermost in the minds of gas distributors, gas storage has developed into a major problem. Things got off to a bad start with the East Ohio Gas Co.'s Cleveland disaster in 1944, and the problem has since been approached with a great deal of caution. Natural gas is now being stored underground in pressure cylinders, which seems a reasonable solution. Something new which may prove even better is a low-temperature adsorption process developed by J. F. Pritchard & Co. and the Floridin Co. Some 200 volumes of gas can be adsorbed at minus 250 deg. F. in one volume of fullers earth. The cost is claimed to be competitive with that of other gas storage methods.

ROBOT PLANTS

Vanishing Labor

For several years some of the scale companies have been pushing the idea of fully automatic proportioning installations for process ingredients, involving adroit combinations of weighing, interlocking and materials handling equipment. Now consultant Brothman (*Chem. Eng.*, Nov. 1949, p. 114, Dec. 1949, p. 115) carries the fully automatic idea to the complete plant. Brothman has already built two such plants and has four more under construction. The idea goes well beyond ordinary concepts of complete instrumentation; it would build the equipment, interlocks and instruments into an integrated whole, together with checks and balances which up-grade the product, contribute to safety and enable labor requirements to approach the vanishing point. So far, it appears that there are no limitations on the kind of process: batch, batch-continuous, or continuous, to which such robotization can be applied.

INTEGRATION

Bilateral

Burgeoning demand for sodium metal, which finds its biggest use in tetraethyl lead, has touched off added plant expansion in Ashtabula, that fast-growing Ohio chemical center. Result: a brace of new plants there, slated to be up and running by this April.

One is the new $10 million plant of National Distillers that will turn out 18,000 tons a year of sodium (present U. S. output is roughly 75,000 tons a year, all made by Du Pont and Ethyl Corp.). Other products will be sodium hydride and chlorine.

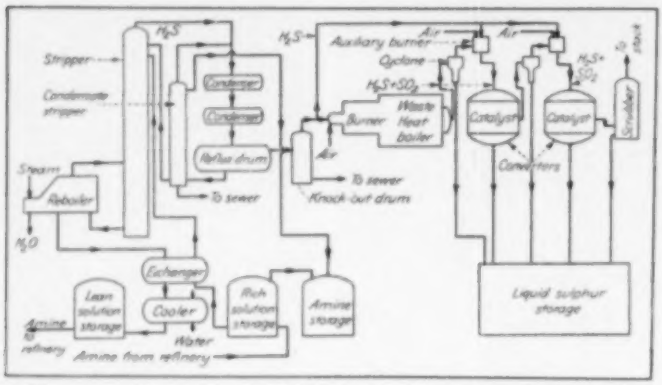
The other is the $1.5 million plant that Hooker-Detrex is building at Ashtabula. It will take substantially all of the 27,000 tons a year of chlorine produced in the National Distillers plant, turn it into an estimated 40 million pounds a year of trichloroethylene to swell the current 200-million-pound annual capacity for this solvent. Delivery of the chlorine from the neighboring plant will be via pipeline.

Unilateral

$50 million is what Union Carbide is reported willing to spend for an integrated industry it is planning near Marietta, Ohio. Nearby strip mining properties now owned by the company will supply coal for a single mammoth power plant. Electromet will make electric furnace alloys, National Carbon will make industrial carbon products, and Bakelite will turn out plastics and probably some of their raw materials, including phenol.

ALSO RUNNING

- The Glidden Co. has completed its big margarine plant near Macon, Ga. and plans to construct a refinery for edible oils on the same site.
- Armour and Co., at McCook, Ill., started up late in 1949 a plant designed to process up to 100,000,000 lbs. a year of raw fats and oils to make glycerine, fatty acids, and various other organics.
- Two companies started construction of soybean processing plants: Cargill, Inc., at Chicago, Ill., and A. E. Staley Mfg. Co. at Decatur, Ill. Tacoma Vegetable Oils, Inc., Tacoma, Wash., plans to build a $5 million plant for coconut oil from Philippine copra.
- Until Allied's Solvay Process Division entered the business, Du Pont was the sole producer of urea. Now Solvay's new South Point, Ohio, plant is coming in. It can produce 170 tons of urea a day.
- New resin plant of U. S. Industrial Chemicals at Newark, N. J., is a whopper. Said by USI to be the biggest in the world, it can turn out 100 million pounds of resins a year.
- Sometime in the second half of 1950 Teflon for equipment lining should become available from the plant Du Pont is building at Parkersburg, W. Va.; it is expected to start production in July.



Sulphur recovery from refinery H_2S, Hancock Chemical Co., Long Beach, Calif.

WASTE NOT

Public Takes Notice

Wastes are agitating not only the process industries, but the entire nation, particularly those wastes that pollute streams and atmosphere. Donora's dramatic smog did not bring about the incipient crack-down that has been building up for a long time, but it catalyzed it. More and more, U. S. Public Health Service, operating under the Water Pollution Control Act of 1948, will find itself projected into industry affairs, and more and more will industry find it necessary to control its wastes—and reap a profit therein if possible. Too much is being done for summary here, but a few particularly significant developments should be noted.

Sulphur recovery from sour gas is beginning to make a dent in U. S. sulphur supplies. For several years two plants of Southern Acid & Sulphur have been recovering the yellow mineral from Arkansas gas, but now there are four more plants, either operating or on the way, which will add somewhere around 500 long tons per day to the total supply. These include Hancock Chemical Co.'s plant at Long Beach, Calif., using a Badger-built British Simon-Carves process; the Stanolind plant at Elk Basin, Wyo.; Texas Gulf Sulphur Co.'s big Worland, Wyo., plant which started operation only a few days ago; and a small unit built by Freeport Sulphur Co., for Texas Co.'s H_2S at a refinery near Philadelphia.

Fluorine recovery from phosphate sintering plants and aluminum pots is another big story recently written by Monsanto, Victor, Alcoa and TVA. Over $2 million in research and equipment has gone into the installations mentioned. The processes will probably be self-supporting and may even return a small profit. Also Monsanto and Victor are sponsoring research on fluorosis in livestock at the University of Tennessee.

Although there is an earlier, smaller installation on this continent, Soundview Pulp Co.'s system of recovering heat and SO_2 from sulphite blowpit gases at its Everett, Wash., plant, seems to hold important lessons for the sulphite industry. Nuisance of SO_2 discharge is eliminated. Equally attractive is a saving in heat and sulphur that amounts to almost $1 per ton of pulp produced. Adaptation of a Swedish process, it was installed by American Heat Reclaiming Corp.

ELECTRO

Stronger Caustic

Two consuming trends affecting the caustic soda industry seem to have been getting together since World War II. One is the natural desire of users to pay freight on as little water as possible and still secure a liquid product. The other is the emergence of rayon manufacture as the industry's single largest customer. Freight saving has been pushing liquid caustic concentration ever higher, until now it is possible to buy the 73 percent product in tank cars, ready to be diluted automatically as the car is unloaded. Simultaneously, the quality requirements of rayon caustic have placed more and more emphasis on the mercury cell. So it is of considerable interest to learn that the new installation of Krebs mercury cells at Dominion Alkali in Quebec will not only produce rayon grade caustic, but will turn out a 70 percent concentration direct from the cells.

More Phosphorus Coming

New electric furnaces to turn out elemental phosphorus are going up in the East and West. At Pocatello, booming Idaho fertilizer center, Food Machinery & Chemical Corp. has one new furnace with an annual capacity of 8,000 tons already in operation. Another, to be completed early this year, will add 9,000 tons to Food Machinery's yearly output of phosphorus. To pay for its two new furnaces, Food Machinery plunked down $7.35 million.

In the East, Virginia-Carolina is pushing construction of its new electric furnace in South Carolina. To be one of the biggest ever built, it will feature many radical design improvements.

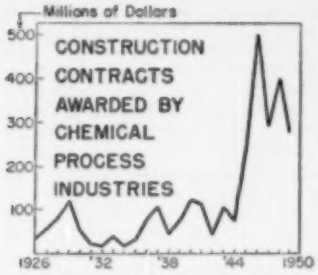
RANK NEWCOMER

Acrolein: Two Tamed It

Acrolein, despite its nasty, toxic character, seems to have such intriguing possibilities in the field of organic synthesis that two chemical companies, Carbide & Carbon and Shell Chemical, are stepping up production of acrolein itself and also pushing work on a raft of its derivatives. Already, both these companies have slashed the price of acrolein from $1 to 50c. a lb.

Late in 1949 Carbide & Carbon began commercial production of acrolein at its South Charleston, W. Va., works. At about the same time Shell Chemical announced that its new pilot plant at Emeryville, Calif., was successfully turning out acrolein by a brand new process—the direct oxidation of propylene. So successful, in fact, was Shell's new process that it shut down its 20,000-lb.-a-month unit at Houston, Tex., where it had been making acrolein by the thermal cracking of diallyl ether.

Both companies are producing limited quantities of acrolein derivatives. Acrolein's future, for example, ties in with the manufacture of synthetic methionine, for an acrolein derivative is a raw material for the synthesis of this vital amino acid, which Dow is currently producing in its new Pittsburg, Calif., plant.



CAPITAL SPENDING

Year of Plenty

The chemical industry's capital expenditures program will continue through 1950 at a high level. Planned expenditures, in dollar volume, are expected to be only 5 percent less than in 1949.

Plans for plant and equipment purchases in the chemical industry in 1950 total $1,040 million, as compared to $1,100 million actually spent by the industry in 1949. The petroleum refining industry plans to spend $580 million in 1950, as against $700 million actually invested last year. Another key industry, many of whose operations are in the chemical field, the rubber industry, actually plans to spend more in 1950 than in 1949. Rubber companies now have plans for new plant and equipment totalling $82 million compared with the $75 million they invested last year.

These are key conclusions from the 1950 survey of "Business Plans for New Plants and Equipment" conducted by the McGraw-Hill Department of Economics. Summarizing the plans of American industry to buy new capital equipment in 1950, the survey shows:

- Industry as a whole—the manufacturing, mining, transportation, and utility industries—is now planning to invest $12,400 million in new facilities in 1950. This is a decline of 13 percent from what these industries invested in 1949.
- The chemical industry shows less of a decline from 1949 to 1950 than any other major industry except food. In fact, with the declines in plant and equipment costs that have taken place this year, the chemical industry's plans suggest that the physical volume of new facilities in 1950 may be about as large as those put in place in 1949.
- Industry has already completed much of its adjustment to a lower level of capital expenditures. The chemical industry, for example, actually spent less in 1949 than it had planned. The industry actually spent $1.1 billion last year when, at the start of the year, its plans for new facilities, as reported to McGraw-Hill, totalled $1.2 billion.
- The chemical industry expects sales to gain 4 percent next year—evidence of the sustained growth curve in chemicals. At least one segment of the industry, however, that producing the raw materials for rayon and other synthetic fibers, expects a 12 percent gain. Producers of other chemicals, on the whole, expect smaller gains in sales. They look for an average gain of 3 percent. Petroleum refiners expect their sales to gain 2 percent.
- The 1950 capital program will raise the chemical industry's capacity 8 percent by present plans. Petroleum refining capacity is expected to gain 3 percent. Some 60 percent of the chemical industry's capital investment, and 37 percent of the petroleum refining industry's capital budget, will go toward expanding facilities. The balance, under the plans reported to McGraw-Hill, will go for replacement and modernization of existing facilities.
- Retained profits and depreciation reserves are counted on to provide 97 percent of the funds for the chemical industry capital program and 96 percent of the money for the petroleum refining industry's program. In general, among all manufacturing companies, internal sources are expected to provide more than 90 percent of the funds needed.
- The chemical industry's 1950 plans seem firm. Almost 70 percent of the companies report that they would not reduce capital expenditures even if general business activity fell off 20 percent during the year. Petroleum refiners, however, report that such a drop in general business would bring cutbacks in capital programs. About 90 percent of the industry would cut its program sharply.

These are the conclusions of the third annual survey of industry's plans for new plant and equipment expenditures. The surveys have proved important indicators of activity in capital goods fields. Last year, for example, the survey showed industry planned to spend a total of $14.1 billion and actual expenditures were $14.3 billion, although some industries did not spend as much as planned and others spent slightly more.

CONTINUOUS PROGRESS

Super

Superphosphate making has largely been a batch operation in the United States, despite interest in continuous processes in Europe. Recently, several home-grown continuous processes have gone into U. S. plants, while one foreign process has invaded the U. S. market. Batch processes have been highly mechanized in most plants, which is one reason for the slow emergence of continuous processes in this country. Indications are that the trend will continue, although the spread of continuous plants is likely to be slow.

Soap

New processes to the contrary, the soap kettle is still with us in 1950, but this does not mean that progress is at a standstill. Several of the major soapers are now operating continuous pressure processes which condense the long kettle process into a matter of minutes. Sharples Corp. has its own continuous process that turns out neat soap in less than 2 hr. without high pressure. Several installations have been made, chiefly in smaller plants.

Fat

Continuous fat splitting processes are appearing with increasing frequency in the fatty acid industry. Among these, Armour at McCook, Ill., Swift at Hammond, Ind., and General Mills at Kankakee, Ill., have all made recent installations. Swift, for example, uses the Blaw-Knox high-pressure, high-temperature splitting process, followed by Kellogg's processes for solvent fractionation and solvent crystallization from propane.

Oil

Traditionally a batch process, vegetable oil bleaching went continuous last year in the Sherman, Texas, plant of Mrs. Tucker's Foods, Inc., Both soybean and cottonseed oils are bleached by the new vacuum process and are found to be superior in quality as a result. Following eight years of experiment, the process was turned over under license to Girdler Corp. for design and construction of the company's new plant.

BUMPER CROP

Tonnage Oxygen

Several plants are now producing successful low-purity oxygen, including several that serve the steel industry; a 360-ton unit built and operated by Linde to serve the gas producers at Du Pont's Belle, W. Va., ammonia plant; the McCarthy Chemicals 175-ton unit at Winne, Tex., which is helping to turn out oxygenated hydrocarbons such as methanol, formaldehyde and acetaldehyde from stripped natural gas; and the transplanted 25-ton German Linde-Frankl unit in use at the Bureau of Mines' Louisiana, Mo., synthesis gas plant. Once Carthage Hydrocol's two 1,000-ton units go into operation this year, other plants in operation or projected will look rather small.

Cold Rubber

GR-S polymerization at about 41 deg., rather than the standard 122 deg. F. temperature, brings some striking improvements in quality in synthetic rubber production, which however still fails to make the synthetic equal to natural rubber. Result of these improvements has been encouraging enough to up the original planned capacity from 21,000 to 198,000 tons, which is well above the government's mandatory requirement for synthetics to be used in tires.

Pharmaceuticals

With antibiotics now accounting for more than half of the pharmaceutical industry's income, penicillin and streptomycin are being eclipsed by the newer comers, such as procaine penicillin, dihydrostreptomycin, aureomycin, chloromycetin, neomycin and bacitracin. The last two, produced respectively by Pfizer; and by Commercial Solvents, Penick, Merck and Sharp & Dohme, are still in the experimental class. Parke, Davis' chloromycetin is in a class by itself as the only antibiotic produced commercially by a synthetic process. It is, in fact, made both biologically and synthetically, the two yielding identical products.

Still about the rarest among rare chemicals, the hormones cortisone and ACTH gained probably more newspaper space in 1949 than all other medicinal chemicals combined. The first has now been synthesized from soybean sterol by Glidden, but it appears that a long time must elapse before supplies will be sufficient to treat more than a lucky few among the country's rheumatoid arthritis sufferers.

Petrochemicals

Petrochemical development tended to settle down during 1949, after a tremendous spurt in 1948. Many aspects have already been mentioned. Among others are Shell's glycerine, ethanol and acrolein syntheses, the first two of which had profound effects on their respective markets; tremendous growth of synthetic detergents, most of which are petrochemical derivatives; large increases in capacity for ammonia from natural gas; and Du Pont's radical new process for nylon salt from butadiene, now under construction at Victoria, Tex.

Insecticides

Largely through misuse, which led to much adverse publicity, 1949 was a bad year for some of the newer insecticides, particularly DDT. Attention is being focused on the less toxic compounds such as Du Pont's methoxychlor, and increased emphasis is being given to toxicology. There may be significance in the decision of Sherwin-Williams to quit pesticide manufacture, since it may indicate a growing feeling that profit possibilities hardly justify the potentialities for suits against manufacturers.

Fibers and Films

Although as yet even nylon accounts for only a small part of synthetic fiber production, much interest continu s in new non-cellulosic materials. Orlon, Du Pont's polyacrylonitrile fiber, is still available only in pilot plant quantities. Carbide, after several years with Vinyon and Vinyon N—respectively a vinyl chloride-acetate copolymer, and a vinyl chloride-acrylonitrile copolymer—has now decided to push Dynel, a staple fiber related to Vinyon N. Newcomer Chemstrand, Inc., formed jointly by Monsanto and American Viscose, is developing an acrylonitrile-vinyl acetate fiber which is partially hydrolyzed to improve its dyeing properties. Virginia-Carolina's zein-based protein fiber, Vicara, is on the market and Du Pont is reported to have new Fiber V both under test and under wraps. Probably not intending them for the fine filament field, American Viscose is now producing polyethylene monofilaments, primarily as a competitor of monofilament Saran.

Meanwhile, transparent film continues its rapid expansion. Du Pont currently makes about 75 percent of all cellophane, and American Viscose the remainder, but expansion of the latter's Fredericksburg, Va., plant may up its output to around 45 percent. Meanwhile, following a long search, Du Pont has found another competitor. With Du Pont's help and blessing, Olin Industries is going to install capacity for 33 million pounds per year at its Pisgah Forest, N. C., plant.

Plastics

Plastics developments continue to carry us ever closer to the Plastic Age. Significant developments include enormous recent increase in polyethylene, which quadrupled to some 50 million lb. in 1949; and the decline of nitrate plastics, which are being driven out by newer cellulosics. Koppers Chemical Div., however, is dropping cellulosics to concentrate on polystyrene. Plasticizers also change, evidence indicating that adipates may be displacing phthalates and maleates. Teflon and Kel-F, both still extremely expensive, are developing new corrosion resisting applications at a terrific rate. Teflon's usage will be enormously stepped up through development of Teflon suspensoid, which is sprayable and readily forms adherent coatings. Kel-F, too, is soon to be produced in suspensoid form, a fact that may tend to equalize the range of uses for these two virtually non-corrodable materials.

Fluorine Chemicals

Both organic and inorganic fluorine chemicals are on the march. Teflon and Kel-F have already been mentioned. The Freons are expanding and now Du Pont is to assume full ownership of their manufacturer, Kinetic Chemicals. Fluorocarbon lubricants, developed originally for Oak Ridge needs, are now made on a small scale by both Hooker and M. W. Kellogg. High in price, they seem pointed at present only toward applications for

highest temperatures, or where most severe corrosive attack is encountered. Meanwhile Penn Salt, fluorine pioneer, has just started up its new $2 million HF plant at Calvert City, Ky., aiming to be ready for the turn to fluorine which may just be around the corner.

Urea

Urea has long been the private preserve of one company—Du Pont. Now Solvay is entering the field with a $3 million plant at South Point, Ohio, which is rated at 170 tons per day and may be operating shortly. Meanwhile other producers may be in the offing. At least, that is the hope of Foster Wheeler, Chemical Construction and Hydrocarbon Research, all of which have processes for sale.

Silicon Chemicals

Silicones may be expected to head sharply upward, following the entry of new companies into the field. Where GE and Dow formerly held sway alone, Linde is now producing several new silanes. Plaskon has also entered the organosilicon race and aims eventually to reduce the cost of basic materials by a factor that may be as high as ten.

Rocket Fuels

This jet-propelled age is headed far beyond the old-time Fourth-of-July rocket. Chemicals of many sorts are getting into the picture, including the fuels, hydrazine and nitromethane, and the oxidizers 90 percent hydrogen peroxide and nitrogen tetroxide. Of these, nitromethane has the interesting property of requiring no oxidizer. And nitrogen tetroxide is mostly oxygen, yet is said to be relatively safe and easy to handle.

Titanium and Oxide

Titanium metal has suddenly blossomed forth as the newest construction metal. Du Pont has been turning out ingots for some time and now Allegheny Ludlum is revealed as making the same product, as well as shapes and forgings. The prices are high, but experimental interest is still higher, for titanium is as strong as stainless, more corrosion resistant, has higher heat resistance, yet weighs but 60 percent as much. Meanwhile, plans are going ahead for a tremendous titanium dioxide-iron development at Tio Lake, Quebec. Kennecott Copper and New Jersey Zinc have launched Kennco Exploration Ltd., to develop the property which will yield high TiO_2 slag and high-grade iron. Titanium metal may be in the offing, but New Jersey Zinc claims to be concerned only with TiO_2 pigment.

Compressible Lubricant

Nordstrom Valve scored an unusual and idea-inspiring point during 1949, with the introduction of the world's first compressible semi-fluid—a lubricant for plug valves which is put in under pressure and thereafter feeds itself until its pressure runs down. Nordstrom wouldn't say what else this material might be good for, but the idea of shock absorbing and recoil devices immediately occurs to anyone taking a moment to consider it.

Sodium and Hydride

Du Pont suddenly changed its plans for establishing a sodium metal and sodium hydride plant at Ashtabula, Ohio, turning its option and its process over to National Distillers. The $10 million plant is to pipe its chlorine to the $1.5 million plant of the new Hooker-Detrex combine which will produce trichlorethylene next door. Its 18,000 lb. sodium capacity will go partly into hydride, but mainly will swell the 75,000-lb. total of sodium metal now produced by Du Pont and Ethyl Corp.

Direct Nitric Acid

As often in the past, history repeats. Considerably before Haber and Claude set up the basis for the modern ammonia industry, oxygen and nitrogen in the atmosphere were combined in the electric arc to form nitric oxide, thence NO_2 and N_2O_4, and by combination with water, nitric acid. During the last war, the idea revived at the University of Wisconsin, but with the difference that the regenerative Royster furnace, or pebble heater, was to be used instead of an arc to attain the needed 4,000 deg. F., or more. Both Westvaco and Food Machinery Corp. were interested in such a process before their merger in 1948. Naturally, then, the idea grew and the combined organization built a pilot plant at San Jose, Calif., reputedly costing $700,000 and designed for 1,000 lb. HNO_3 per hr. The results have not been announced, but the process should be operating, especially if the refractory problem has been solved. Stabilized zirconia, believed suitable for 4,500 deg. F., may be the answer here. If the process pans out technically, the economic situation should soon be clarified. It might mean, for instance, that comparatively small direct nitric plants will compete with nitric via ammonia and thus lead to wide dispersal of agricultural chemical production.

Hydrogen by Dissociation

On its face, the idea of knocking ammonia apart to secure its hydrogen sounds like Alice-in-Wonderland economics. Strangely enough, it is not. Hydrogen for ammonia is produced in tremendous plants at extremely low cost. Intermediate sized hydrogenators cannot match that cost by other means, even when they must pay freight on ammonia and pay also for the unwanted nitrogen. Therefore, in the range of operations requiring about 5,000 to 6,000 cu. ft. per hr. of hydrogen, ammonia dissociation is practical and dissociators have been installed in recent months by several oil and fatty acid hydrogenators.

Ceramic Tricks

Ceramics, old dogs though they may be, have developed some decidedly new tricks. To mention only a few, there are the cermets, ceramets, or ceramals which are ceramic-metal combinations, compressed and sintered to give new construction materials more heat- and corrosion-resistant than metals, and much stronger and more shock resistant than ceramics. Just where they will go it is too early to predict, but gas turbine blading is an interesting possibility already being tried. Almost as revolutionary may be Stupakoff Ceramics' new reverse-expansion ceramic, Stupalith. Normally expanding on cooling and contracting on heating, the composition can be altered for virtually zero expansion, which leads to the definite possibility that 2,000-deg. gas turbine parts can be produced successfully from it.

BASING POINTS

Up to Supreme Court?

Is it legal for shippers to absorb freight in order to meet price competition? This question may be settled, finally, by Supreme Court action instead of by legislation.

Recall that two years ago the Supreme Court handed down a decision that was interpreted to mean manufacturers could no longer absorb freight costs in pricing their merchandise. Certainly the decision—in the Cement Institute case—banned the so-called basing point system.

Republican leaders in the 80th Congress went to work to do something about making freight absorption legal so long as companies did it individually, not in concert with others—a violation of the anti-trust laws.

Then last year the Senate passed the O'Mahoney bill that banned a basing-point system, but legalized individual freight absorption extended in good faith to meet competition. The House passed similar legislation. A conference committee of the two houses then rephrased the language of the legislation, and the House approved that, too. The Senate balked on the proposal last October, but agreed to take it up again this year when Congress reconvened.

The crucial provision of the legislation had to do with whether a big company could make a price cut to one buyer and not another. Present law says you can't do that if the result may tend to lessen competition.

Case of Indiana Standard

The Standard Oil Co. of Indiana was accused of doing just that in selling gasoline to some retailers in Detroit at a lesser price than it offered others. The lower courts held that such action violates the law.

Now the matter is up to the Supreme Court. The Federal Trade Commission argued that the law had been violated, while Indiana Standard said it had cut prices in good faith to meet competition.

So, no matter how the legislation finally is disposed of, if the Supreme Court upholds Standard—and there are a lot of experts who think it will—then the question would be settled. In that event, legalizing of freight absorption would be done quickly.

BIGNESS

What's Wrong With That?

Bigness is the major new issue in anti-trust policy. The Celler committee is carrying the ball on this phase of the program. Already, Charles E. Wilson has gone on the witness stand to show why General Electric should be left alone—big as it is. And Rep. Celler has called upon President Crawford H. Greenewalt of Du Pont to defend his company's size (photo).

Lines of Attack

New developments in the anti-bigness campaign will be along these lines:

(1) Price leadership—There'll be a probe of a giant's influence over lesser competitors that makes an entire industry follow the giant's lead in setting prices.

(2) Efficiency—The Celler group will try to put forth the highly debatable argument that bigness contributes to inefficiency, that inefficiency mounts in proportion to size.

(3) Research and development—Some big companies like U. S. Steel will be asked to show what contributions they've made to technology, production, distribution and the like. U. S. Steel, in fact, will be called to tell its story sometime this month.

The first real show will begin this spring when the government takes Du Pont, ICI and Remington Arms to trial for cartel activities. The Du Pont case involving General Motors and U. S. Rubber, however, probably won't get started until fall.

Blames Interpretations

Most anti-trust actions against business are due to shifting interpretations of the law by the courts, according to Harold C. Haskell, Du Pont's general counsel and head of its legal department.

"I believe that by far the largest number of anti-trust indictments and civil suits come about because business men enter upon a course of action in all good faith, only to discover that the Department of Justice and the courts view as a serious offense this year something that was accepted as industrial practice last year," he declares.

Haskell confesses he does not know precisely how business men are to avoid legal actions by the government that stem less from their own conduct than from changes in legal opinion.

"There are great practical difficulties lying in the way of any solution," he says. "I mention the point because it is important for you to know that the majority of anti-trust actions cannot be attributed either to willful violations of the law by business men on the one hand, or prosecution for political advantage by the government on the other."

Citing the Alcoa case, Haskell says, "The court specifically stated that it did not matter whether or not monopoly had been obtained by legal or illegal means, that the retention of the monopoly itself was in violation of the law.

"If this doctrine holds—and the evidence is that it will—then I take it that under the laws of the land you can, by perfectly legal means, obtain a certain percentage of the business in an industry and find that you are automatically in violation of those laws. There is thus applied an automatic check to growth."

Haskell says it makes little difference what percentage of any business might at any time be considered legal for a company to obtain. Once the principle is established that there should be a ceiling on growth, "the percentage can be changed to whatever the government thinks it ought to be."

As for the charge that big companies are putting small ones out of business, he calls attention to government statistics showing that while 2,400 companies "disappeared"

through mergers from 1940 to 1947, more than 100,000 new firms went into business during the same period.

While the court in the Aluminum Co. case, as Haskell observes, held that big business could be in violation of the law regardless of whether its operations were good or bad for the public, he maintains that it is up to the people to decide this question.

Pointing out that from Du Pont's research laboratories have come neoprene synthetic rubber, nylon, moisture-proof cellophane and fast-drying lacquers for the automobile industry, Haskell reminds us that:

"Thousands of American men and women today have jobs—and good jobs, too—who would not have them were it not for Du Pont research and Du Pont production.

"Du Pont created opportunities for the existence of thousands of small businesses.

"It has been possible for Du Pont to do these things because Du Pont is a large and successful company that can take big risks. By long and steady growth and a policy of reinvesting part of the earnings in the business, this company has financial resources to invest in ventures far beyond the scope of small organizations."

In truth, he says, "there exists between big and small business a fundamental partnership aimed at furthering the objectives of the American economy." As evidence of this, he calls attention to the "literally thousands of small producers" who supply General Motors with parts for automobiles which, if manufactured on a small scale instead of by mass-production methods, would make a car cost $50,000.

To illustrate further the small and big business partnership, Haskell traces a cone of Du Pont rayon yarn from the winding machine to the finished dress. In 47 days, he says, 10 different businesses in five states combine to transform the yarn into an $8.95 dress. Two of the firms, including Du Pont, are large. The other eight, employing from one to 220 persons, are typical small enterprises.

In answer to the contention that big business is bad because it eliminates competition, Haskell gives a "few" examples of the "rugged competition" Du Pont faces. It has, he says, 1,200 competitors in the paint industry, bigger producers competing with it in the making of rayon and photographic film, the competition with nylon of wool, cotton, silk, rayon and other synthetic fibers, the competition with cellophane of plastic films, waxed paper, glassine, metal foils and other wrapping materials.

Competition in Du Pont, Haskell concludes, "is far from dead," and he expresses the belief that it will become "even more intense" in the future.

POLLUTION

Five-Year Plan

Public Health is just getting started on its five-year program of cleaning up streams, seeing to it that industrial waste is more efficiently handled. It is now working with a $2,725,000 fund, the first part of a $31,000,000 allocation.

Most of the money is going out in loans and grants to state and local governments. It's being used for construction and for research, too. With some of the funds Public Health is building a water-pollution laboratory at Cincinnati.

Grants have gone out in sums ranging from $35,000 to New York down to $8,750 to Nevada.

There is this really important development to watch for: a proposal that Congress revise the tax laws so an industrial plant can amortize modernized water-treatment facilities. President Truman has indicated he favors some kind of aid to business generally for stepped-up amortization of plant and equipment, so the chances that something will be done are fair, though not certain.

Of Smoke and Smog

California's smog, following up the poison smoke disaster at Donora, Pa., makes certain that Congress will see to it this year that research on air pollution will be accelerated.

Reps. Kelley and Eberharter have introduced bills to give the U. S. Public Health Service $750,000 for investigation and research into ways of beating the problem. And the President's 1951 fiscal year budget contains funds for further research.

You'll be seeing California, New York and Pennsylvania congressmen, as well as those from other industrial sections, putting pressure on Congress to act upon the legislation.

States are doing some work on smoke control generally, but the work goes slowly. California hasn't gotten far with work on the smog that hung heavily over Los Angeles last fall. There is a study going on; it's being conducted by the Stanford Research Institute.

Up to now, little work has been done on smog except by Public Health. It takes money to do a good job in the field of air pollution abatement. Public Health spent $150,000 for its inquiry on Donora last year.

Newest area to come in for study—if money is made available—will be Staten Island, N. Y.

SCIENCE FOUNDATION

A Virtual Certainty

The President's specific endorsement of a National Science Foundation, to support research and to train scientists, is sure to be enough to shake loose legislation now blocked up in the House Rules Committee. The Senate has already approved the legislation, the House Interstate Committee has okayed it, and once it gets to the House for a vote, there's no chance it won't be passed.

The program will start out modestly, with grants to universities and laboratories, as well as scholarships to students, costing little in the first year or so. The program, however, does build up to a $25-million-a-year operation.

TOXICITY

Self-Rising Tempers

Late in the summer of 1949 the battle of attrition being fought in Washington between the fats and oils interests and the producers of synthetic emulsifiers drew to a close. The battle had been fought over whether emulsifiers — polyoxyethylene monostearate, sorbitol mono-stearate and other modified esters of fat-forming fatty acids—should be permitted as optional ingredients in bread.

A Food & Drug Administration hearing room had been the battleground. The hearings began in November 1948 and continued off and on for more than 100 working days. The record ran to 20,000 pages plus 300 exhibits.

The crucial question that Food &

Drug will have to decide: Have the synthetic emulsifiers been used and tested in food products over a long enough period to prove conclusively that there is no danger of toxicity?

So far, the synthetic producers—spearheaded by Atlas Powder Co.—have shown that humans taking large quantities of the emulsifiers in medical research tests have actually been helped in assimilating fats—and not hurt. It's certain there is no question of acute toxicity. What's more, the fats and oils people haven't been able to prove that the emulsifiers are toxic.

Many bakers are already using the emulsifiers. Most of these will continue to use them unless they're banned, which now seems unlikely. This market for emulsifiers is one that Atlas, most prominently, built up after the war. The emulsifiers do two things in bread that many bakers like: (1) they keep bread fresher or softer for a longer period of time; and (2) they cut costs, since the emulsifiers are less expensive than the fats and oils they replace.

End of the hearings, however, didn't mean that Food & Drug would quickly promulgate standards.

There's still plenty of opposition to the synthetic conditioners for bread. Rep. Keefe of Wisconsin is demanding an investigation of what he calls "chemicalization of food." But the House Rules Committee is sitting on Keefe's resolution, which takes in not only chemicals in foodstuffs but also the question of insecticides, and there's little chance that such an investigation will be set up.

Whatever answers come out of all this government curiosity will be those of Food & Drug, not Congress. First thing to look for is the Food & Drug Administration's report on bread standards, due out soon.

Residual Toxicity Investigated

In January 1950 the Food & Drug Administration opened hearings on the problem of human tolerance for chemical residues left on fresh fruits and vegetables from compounds used to control insect pests and plant diseases, or to affect the metabolism of the plants. As a result of the hearings, presided over by Bernard D. Levinson, regulations would be issued limiting the quantity of poisonous residue permitted on or in fresh fruits and vegetables. Also limited by the forthcoming regulations would be the quantity of fluorine remaining as insecticidal residue on apples and pears.

Elsewhere, rigid legal control over insecticide users and producers was beginning—at the state level. Many states have already passed laws regulating the use of herbicides (such as 2,4-D), and now insecticides are getting the same treatment. In California, Bill 485, introduced by State Senator George J. Hatfield, was passed in June 1949. It became effective on Jan. 1, 1950. This California law controls use of both herbicides and insecticides. Thus California became the first state to control insecticide use (others, like Texas, have registration laws).

In Arkansas, the state supreme court has ruled that any manufacturer failing to label containers with full and explicit directions and warnings about risks in using his products is liable for damages caused by chance application (by airplane spraying, for example) of chemicals on fields for which they were not intended.

Pulling Up Stakes

While other considerations were not being overlooked, makers of agricultural chemicals were pondering the impact of these federal and state actions on the future of their business. As 1950 began, Sherwin-Williams, one of the biggest insecticide manufacturers, decided to throw in the sponge. It halted production in its Bound Brook, N. J., and Oakland, Calif., plants, shut down its Yakima, Wash., laboratory. And now B. F. Goodrich Chemical Co. is nearing completion of its hush-hush study of the agricultural chemicals situation. Its decision on whether to pull up stakes and get out of this business is only weeks away.

GOVERNMENT RUBBER POLICY

Some Plants For Sale?

Synthetic rubber plants may be offered for sale to private industry this year.

A recommendation that the government sell at least part of its synthetic capacity has been drafted within the Administration.

Congress in the next few months has to decide whether to "denationalize" the industry. Government plants now are operated under a stopgap law enacted in 1948. It expires in June, and Congress must consider long-range policy before then.

In the end, the government will hold on to part of its plants, and offer the balance to private buyers. But industry will not be free to use natural as it chooses; use of some synthetic will continue mandatory.

Communist advances in the Far East are a threat to the natural rubber supply. Hence any plan finally adopted will keep the synthetic industry strong as a safeguard.

And watch for a requirement that only part of government plants put up for sale can go to big business. Small business will be cut in for a share.

SYNTHETIC FUELS

No Subsidized Industry Now

Don't look for anything spectacular in government subsidization of a synthetic petroleum industry. There'll be talk about voting the Department of Interior's program for putting up three or four plants. But so long as the oil supply remains as it is, Congress won't embark on a program that could cost plenty before completion.

Meantime, the Bureau of Mines will go on with its work at such places as Bruceton, Pa.; Morgantown, W. Va.; Louisiana, Mo.; and Rifle, Colo. But government activity will remain in the pilot-plant stage.

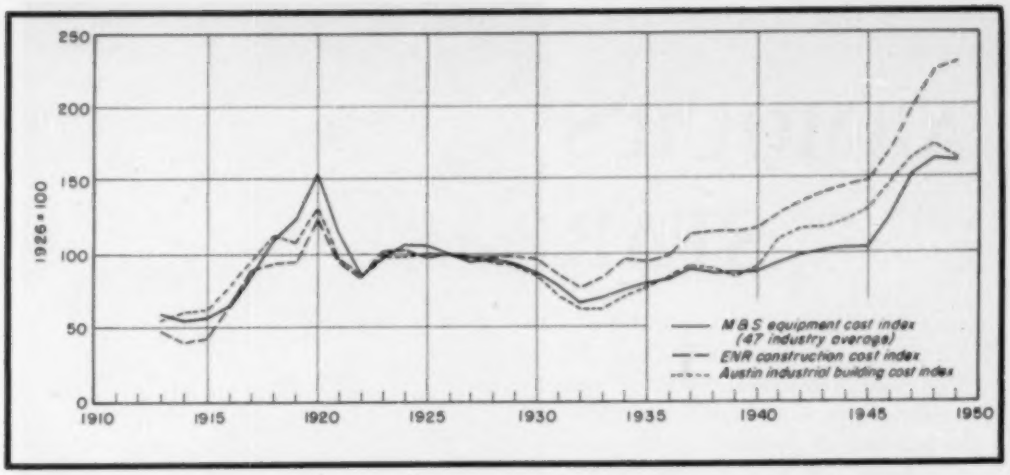
FREIGHT RATES

Reed-Bulwinkle Act Under Fire

That law, passed over the President's veto by the Republican 80th Congress, exempts from the anti-trust act collective action by railroads in setting rates. What happens is that a conference of railroad representatives makes up the intricate set of rates, then turns the lot over to the Interstate Commerce Commission for approval.

Celler doesn't like the law. He takes the position that it weakens the whole anti-trust structure. And, while his committee's main concern is the question of bigness, you can expect him to work on a repeal bill as one of the short-range accomplishments of his two-year probe.

However, there isn't much chance that a repeal bill will get through both houses of Congress this year. For one thing, the Reed-Bulwinkle law has a lot of backing in Congress. What's more, Congress just won't have time to take up such low-priority legislation.



How Process Equipment Costs Varied

Tabulated below are the annual average indexes of comparative equipment cost for eight process industries and four related industries, prepared by the Chicago and Los Angeles evaluation engineering firm of Marshall and Stevens. Extending from 1913 through 1949, the annual averages are supplemented by a tabulation of quarterly figures at the right.

A tabulation in this form, giving quarterly data, appears each month on the second page of our new equipment section, showing the latest revision for the quarter ending March, June, September or December. This feature was introduced initially on pages 124-6 of our November 1947 issue, in an article by the late R. W. Stevens, partner of the firm, which described the basis for the 47 industry indexes regularly issued by the firm, and the method of weighting of the process industry average.

Charted above is the M & S 47-industry average plotted on the same grid with the Austin Co.'s index of industrial building costs, and the *Engineering News-Record* index of heavy construction costs. Because the high point reached late in 1948 continued over into 1949, the downturn in 1949 shown by the averages is less marked than monthly figures show.

Marshall and Stevens Indexes of Comparative Equipment Costs

(1926 = 100)

Industry	Dec. 1948	Sept. 1949	Dec. 1949
Average of all	166.0	159.6	159.4
Process Industries			
Cement mfg.	159.8	155.9	155.3
Chemical	167.6	163.4	163.3
Clay products	154.8	150.4	150.3
Glass mfg.	157.9	153.5	153.4
Paint mfg.	161.1	156.7	156.6
Paper mfg.	161.4	157.0	156.9
Petroleum ind.	164.2	159.8	159.7
Rubber ind.	166.6	162.2	162.1
Process ind. avg.	165.2	160.9	160.7
Related Industries			
Elec. power equip.	169.4	165.0	164.9
Mining, milling	169.5	164.1	164.0
Refrigerating	181.3	173.9	173.6
Steam power	156.5	152.1	152.0

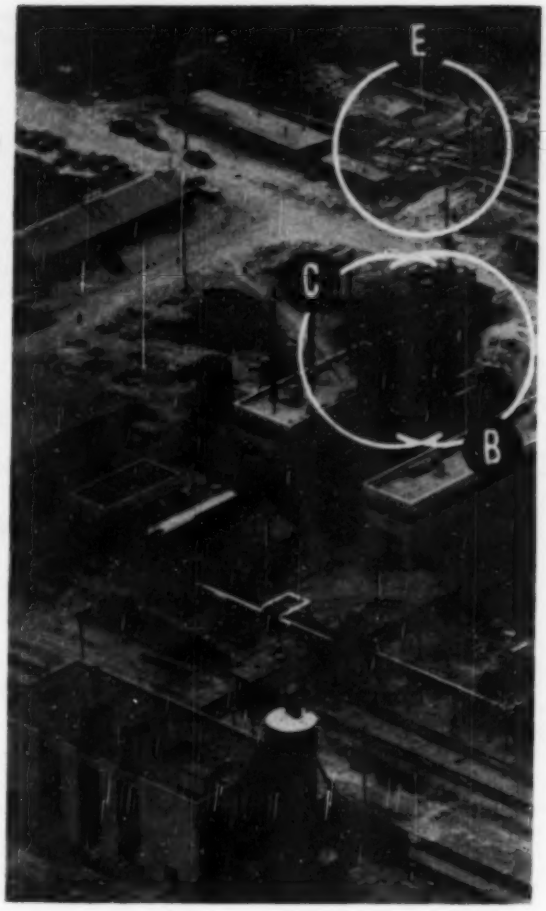
Marshall and Stevens Annual Indexes of Comparative Equipment Costs, 1913 to 1949 (1926 = 100)

Industry	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Average of all	57.9	54.1	55.9	62.8	81.8	109.7	122.0	153.3	115.5	83.5	97.8	103.3	105.3	100.0	99.0	96.5	91.9	87.0
Process Industries																		
Cement mfg.	58.0	55.0	55.0	62.5	80.4	109.1	118.4	149.2	113.6	83.7	95.9	104.6	104.7	100.0	96.5	97.2	92.5	87.0
Chemical	59.0	55.0	56.6	63.0	81.2	111.9	120.6	150.5	113.9	82.5	95.0	105.6	107.2	100.0	100.0	96.9	92.4	82.0
Clay products	60.7	56.7	58.1	65.3	84.6	120.0	128.8	154.3	116.6	82.9	96.6	105.7	105.8	100.0	96.5	97.0	91.7	86.1
Glass mfg.	58.7	54.5	56.2	63.5	83.5	112.1	121.9	151.1	114.7	83.7	96.3	101.9	104.5	100.0	96.2	95.9	92.1	86.6
Paint mfg.	58.2	55.2	55.8	62.8	80.0	108.0	119.8	148.5	116.3	84.1	95.8	104.0	103.4	100.0	94.1	94.6	91.7	85.7
Paper mfg.	60.4	55.3	55.8	63.4	81.0	111.8	121.4	152.6	114.8	83.1	95.6	105.6	108.5	100.0	96.2	96.8	90.9	86.5
Petroleum ind.	58.9	55.1	56.6	64.1	83.2	113.0	122.1	151.5	116.4	82.7	96.3	106.0	105.0	100.0	96.5	97.1	92.0	86.2
Rubber	58.6	55.6	57.4	63.8	81.7	113.8	123.3	154.2	116.2	88.0	96.3	105.9	108.7	100.0	96.4	91.9	91.9	86.2
Related Industries																		
Elec. power equip.	59.1	55.2	56.7	64.3	83.1	114.2	128.6	152.2	116.0	83.6	96.2	106.0	104.9	100.0	96.2	96.9	91.9	86.1
Mining, milling	56.8	55.8	56.5	62.9	82.0	111.9	120.3	149.9	114.1	82.8	95.3	105.6	107.1	100.0	96.7	97.2	92.9	86.7
Refrigerating	59.3	56.3	57.7	63.2	83.2	113.5	122.9	153.5	116.7	83.9	96.5	96.1	109.9	100.0	96.3	97.0	92.0	86.4
Steam power	59.1	56.2	56.8	64.3	83.1	114.2	127.6	152.2	115.7	82.7	96.3	106.1	105.0	100.0	96.4	96.9	91.8	85.2

Industry	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949
Average of all	76.9	66.1	69.4	74.6	78.0	81.6	88.3	84.4	84.8	86.6	92.6	99.6	100.5	102.4	103.4	123.2	150.6	162.8	161.2
Process Industries																			
Cement mfg.	76.8	68.9	70.7	75.7	78.1	82.2	88.8	85.2	84.6	83.4	90.8	97.8	98.3	98.6	99.4	119.7	144.3	156.5	156.6
Chemical	78.0	77.6	70.9	75.4	78.5	82.5	88.2	84.4	83.8	84.6	93.3	102.0	103.1	105.6	106.5	126.8	151.5	164.5	164.5
Clay products	78.0	70.6	71.1	75.7	79.3	83.2	87.8	83.2	82.7	82.7	97.6	98.1	93.6	93.9	94.8	115.0	139.8	151.5	151.5
Glass mfg.	77.9	69.4	71.2	75.4	78.5	82.6	88.0	83.4	83.0	84.3	88.2	93.7	94.7	96.5	97.4	117.6	142.3	154.6	154.6
Paint mfg.	76.6	71.7	70.1	74.6	77.2	81.5	87.4	83.9	83.9	84.9	90.3	97.3	98.3	100.1	101.0	121.2	146.0	157.8	157.8
Paper mfg.	77.1	67.2	69.9	75.4	78.5	82.7	88.1	84.8	84.1	85.1	90.5	97.5	98.7	101.3	102.2	122.4	147.0	158.1	158.1
Petroleum ind.	77.6	70.1	70.6	76.0	78.7	82.6	87.8	83.3	82.3	82.8	88.2	95.2	96.7	100.0	100.9	121.6	147.2	160.9	160.9
Rubber	77.0	67.1	70.7	75.2	78.1	82.2	88.4	85.4	85.3	86.3	94.2	102.7	103.7	105.5	106.4	126.6	151.2	163.3	163.3
Process ind. avg	77.7	73.2	71.3	75.5	79.0	82.4	88.2	84.3	83.6	84.4	91.5	99.2	100.6	102.9	103.8	123.0	149.2	161.9	161.9
Related Industries																			
Elec. power equip.	78.1	70.1	70.7	75.5	78.7	82.7	87.9	84.3	84.1	85.8	90.5	96.5	97.5	99.3	100.2	122.9	150.0	166.1	166.1
Mining, milling	76.8	67.6	80.0	85.6	88.5	92.4	97.1	92.6	92.1	93.1	98.5	105.5	108.2	107.3	108.2	128.4	153.0	165.2	165.2
Refrigerating	75.0	70.0	71.3	75.4	78.9	83.0	87.5	83.0	82.1	83.1	89.0	95.8	97.0	100.1	101.7	125.7	152.2	176.7	175.8
Steam power	88.1	70.1	70.7	75.5	78.7	82.7	87.0	82.2	81.7	82.7	86.6	92.1	92.8	93.9	94.8	116.0	141.7	153.2	153.2

ARMOUR'S STAR

Armour & Company's pride and joy is this new plant at McCook, Ill. The plant's significance: its unique combination of processing units; the number of chemicals it can make from fats, oils and fatty acids.



FAT TREATING AND SPLITTING UNIT–A▸
Produces mixed fatty acids, crude glycerin

FATTY ACID DISTILLATION UNIT–B▸
Produces pure fatty acids (fractionated according to length of carbon chain)

NITRILE UNIT–C▸
Produces pure or mixed nitriles

HYDROGENATION UNIT–D▸
Produces hydrogenated fats and fatty acids, amines and various amine derivatives

SOLVENT CRYSTALLIZATION UNIT–E▸
Not yet constructed. Produces pure fatty acids (fractionated according to iodine number)

RALPH H. POTTS and GORDON W. McBRIDE

In the spring of 1948, Armour & Co.'s Chemical Division began construction of a new fatty acid processing plant at McCook, Ill., about twelve miles southwest of Chicago. Operations started there in September 1949. Principal chemical products of the Armour Chemical Division are pure and mixed fatty acids, nitriles, amides, primary and secondary amines, and such amine derivatives as amine acetates and quaternary compounds. Raw materials are tallows, greases, fish oils, coconut oil, and fatty acid fractions of cottonseed and soybean oils. Major equipment includes fat treating and splitting facilities, fatty acid fractionating stills, nitrile converter and fractionating stills, an evaporator, hydrogenation converter, and a solvent crystallization unit; hydrogen and nitrogen generation units, a steam boiler plant, water treatment and cooling facilities, and space for packaging, storing and shipping complete the layout.

The Armour plant embodies the last word in fatty acid technology—a field notable for the fresh ideas that have swept it in recent years. Ten or twelve years ago, crude impure products were the norm in this industry. Then, anticipating the uses that chemical research might find for good raw materials, Armour and others pioneered the development of pure fatty acids. In 1941 Armour built a small plant at 31st St. in Chicago. Demand has been extraordinary. Pure fatty acids and, more recently, their chemical derivatives, have enabled compounders to improve old products and have inspired chemists to create new ones. By the time it was six years old the 31st St. plant was outgrown, and Armour was planning the new one just completed at McCook.

Choice of this new location was based on many economic and technologic factors. It is served by two railroads (Santa Fe and C&IW), by Chicago city water, and it is in an uncrowded industrial area. Availability of labor in McCook is good, in contrast to some other areas around Chicago, particularly the steel and petroleum zones. Nearby residential areas

RALPH H. POTTS *is superintendent of Armour's Chemical Division and holds many patents on processes used to treat fatty acids.* GORDON W. McBRIDE *is editorial consultant to* Chemical Engineering *in Washington, D. C.; he has followed technologic advances in the field of fats and oils for* Chemical Engineering *since 1939.*

also make the location pleasant for the technical and supervisory personnel.

THE PROCESS

Incoming tank cars of fats and fatty acids are unloaded under cover with steam driven piston pumps delivering the stock to storage tanks. Ni-Resist is used for the fatty acid pumps and ordinary steel for other stocks. Storage tanks for fatty acids are stainless-clad steel.

Conventional refining and bleaching tanks are provided for fat stocks needing such treatment. Foots from refining operations are acidulated in a Monel-lined tank, using 60 Be. sulphuric acid. Storage tanks for this acid and for 50 percent caustic soda hold 11,000 gal.

Anhydrous ammonia is received in tank cars and is unloaded into a storage tank holding approximately two carloads. Liquid level in the storage tank is indicated by a Magnetron gage. A water spray on the outside of the storage tank helps keep it cool in summer time.

Fat splitting, when necessary, is accomplished in a continuous Colgate fat splitter of 5,000 lb. per hr. capacity. Triplex pumps proportion fat and water into the splitter without catalyst at 700 psi. The operating temperature of 500 deg. F. is obtained by direct injection of 800-psi. steam. Evaporation of the "sweet water" from the splitter is accomplished in a stainless steel double-effect evaporator, and the concentrated crude glycerin recovered from the evaporator is shipped to 31st St. for refining. The condensate from the second effect of the evaporator is used as process water.

Fatty acid distillation may follow

Pictured Flowsheet
Pages 172 to 175

the splitting operation, and the distilled fatty acids sold or processed further. (If the further processing is to be nitrile production, distillation is unnecessary.) Fractional distillation of crude fatty acids is accomplished in a three column vacuum bubble plate still of the most modern design. Type 316 stainless steel is used throughout. Heat is supplied by Dowtherm vapor. By this process pure saturated fatty acids are separated. These pure acids range in even carbon chain lengths from C-8 to C-18.

NITRILE CONVERSION

Chemical engineering heart of this new plant is conversion of crude fatty acids to nitriles: $RCOOH + NH_3 = RCN + 2H_2O$. Reaction between superheated ammonia and the incoming fatty acids starts in a small bubble cap tower. Nitrile goes out of the top of this "reactor" as a vapor. The liquid at the bottom of the reactor, heated to about 600 deg. F. by Dowtherm vapor, goes to a pitch stripping column, and thence to pitch storage.

Ammonia fed to the reactor includes recycled excess plus make-up ammonia. It is all heated to about 680 deg. F. by a Dowtherm vapor superheater and then it passes upward through the pitch column to sweep out any nitrile or unreacted fatty acids. The ammonia is then introduced below the surface of the liquid in the bottom of the reactor.

Fatty acids are fed to the reactor at 2,500 lb. per hr., heated from storage temperature of about 210 deg. to about 465 deg. F. by acting as the cooling medium in a reflux condenser. The feed may enter the reactor on any plate chosen for optimum performance.

Reflux of nitrile returns to the top plate of the reactor. Normally the quantity refluxed is about 50 percent of the vapor out of the reactor.

Conversion of fatty acids to nitrile is about 80 percent complete in the reactor. The mixture of nitrile, water of reaction, and unreacted fatty acid and ammonia passes through a Dowtherm vapor superheater after leaving the reflux condenser. The temperature of the vapor mixture is thus raised to reaction temperature and the mixture enters the top of a converter—tubes filled with aluminum oxide catalyst. The temperature in the converter is maintained at 680 deg. F. by circulating Dowtherm liquid. Better than 99.5 percent conversion is obtained here by having an excess of ammonia present to drive the reaction to completion.

Catalyst regeneration is accomplished by burning off the carbon deposit with a mixture of steam and air. Two converters normally alternate in service and in regeneration.

Nitriles are separated from the water and ammonia in a stripper column. The water and ammonia leave the top of the column, and the water is condensed by a water-cooled condenser. Ammonia is recompressed in a liquid sealed rotary compressor and recycled, about 10 or 12-psi. being adequate to move the vapor through the entire system. Any non-condensibles which may accumulate in the system are kept down by a continuous vent between the stripper and the compressor. Nitriles, which are taken from the bottom of the stripper, pass through a cooler and are pumped to the stills or to storage.

Stainless steel is used for the reactor, converter, reflux condenser, vapor superheater, pitch column, and all connecting pipes and valves where fatty acids are present. Steel is used beyond the converter.

NITRILE DISTILLATION TOWERS

Nitriles produced in the reactor and converter may either be sold as crude nitrile, or they may be distilled to obtain higher purity. If amines or their derivatives are to be the end product, distillation of the nitriles precedes further processing.

Primary and secondary amines, made by hydrogenation of distilled nitriles, may be sold as crude amines or they may be further purified by another distillation.

Distillation, to separate the 16-carbon nitrile from the 18-carbon product, is accomplished in an ingenious two-tower installation. Actually the two "towers" are the upper and lower sections of a single column, approximately 65 ft. high and 3½ ft. in diameter.

The upper part of the column, called Tower No. 1, is approximately 53 ft. high. The feed stock goes into the upper half of Tower 1, and the 16-carbon product is taken off one of the top half dozen plates. An odor cut of about 5 percent is taken from the overhead vapor at about 300 deg. F. and the balance is refluxed. A vacuum of about 25 mm. is maintained at the top of Tower 1 by a three-stage steam ejector train and a barometric condenser. The bottom of Tower 1 is maintained at about 75 mm. The distilled product goes directly into storage tanks under nitrogen, without contact with air, where it can be held for some time without discoloration or deterioration due to oxidation.

The lower part of column, called Tower No. 2, is about 12 ft. high. Feed for it is the liquid from the bottom of Tower 1, at about 520 deg. F. Vapor product of Tower 2 is the 18-carbon nitrile, at about 450 deg. F. and 25 mm. This also goes into storage under nitrogen for future processing or shipment. Bottoms product of Tower 2 is returned as feed for the nitrile reactor.

Operation of this equipment has been well planned. Three men on a shift can take care of the nitrile converter, nitrile stills, and the fatty acid stills from a well instrumented central control room at the second floor level. First floor of the control building is largely occupied by centrifugal pumps which feed this unit and remove products and residues. Flow rates and product quality can be observed at the central control room and products properly routed by the operators. The company very definitely feels that best operations are obtained by full instrumentation, with a simultaneous saving in labor.

Dowtherm-A heat is provided by either gas or oil combustion in a small boiler house containing three 4½ million Btu. Dowtherm vaporizers. They are fully automatic and are controlled from the still and nitrile conversion battery control room.

AMINE PRODUCTION

Hydrogenation of nitriles (RCN) to make the amines (RNH_2 or R_2NH) takes place in high pressure autoclaves outside another building. Hazard of hydrogen accumulation inside that building is minimized by keeping all hydrogen lines outside, and by using nitrogen to blow the converted charges from the autoclaves through closed discharge, removable bundle filter presses.

Batches of 10,000 lb. of nitrile are charged into the converters, with nickel catalyst freshly made in the hydrogenation building. High pressure hydrogen is blown into the bottom of the converters for 3 or 4 hr. to complete the reaction. A temperature of about 285 deg. F., agitator, and 250 psi. pressure are required also. Hydrogenation of the nitriles can be controlled to produce either primary or secondary amines.

Fat and fatty acid hydrogenations are also carried out in this area, with stainless steel autoclaves for the latter. The operation is quite similar to nitrile hydrogenation, except that the catalyst is nickel formate and the temperature is up near 365 deg. F. The control panel is on the second floor of this building and pumps are on the ground floor, as in the nitrile conversion and still control building.

Hydrogen for these conversions is

supplied from a 300,000 cu. ft. per day reforming unit operating on natural gas. Three-stage purification keeps the carbon monoxide content below 0.01 percent, an important factor in efficient use of the nickel catalysts.

Nitrogen—for blowing lines and equipment and for blanketing the finished products in storage tanks—is produced in a generator burning natural gas and air. The exhaust gas goes through a monoethanolamine scrubber to remove carbon dioxide. Refrigeration to 65 deg. F. and activated alumina remove most of the water (dew point, −75 deg. F.). Nitrogen to be used for blowing lines is compressed to 100 psi.

OTHER PRODUCTS

Amine acetates are made continuously by simple reaction between the amines and acetic acid in a mixing line just ahead of the drum filling station as the two materials are pumped from their respective storage tanks. A cooler tank with three or four drums capacity provide ample time for completion of the reaction. Stainless steel storage is provided for the acetic acid, which is proportioned into the amine by a flowmeter-controlled pump. Steel storage tanks, mixing line, and drum filling line are provided for the amine and the amine acetate.

Separation of saturated and unsaturated fatty acids with similar length carbon chains can be accomplished by fractional crystallization; the plant (now under construction) uses acetone as the solvent. A nitrogen blanketing system, separate from other plant nitrogen to avoid acetone vapor hazards, is planned to maintain high quality, color, and stability in the products. This department is located at some distance from other units in the plant because of acetone flammability.

Chilling is by ammonia refrigeration, designed for −60 deg. F., with appropriate cooling coils and heat exchangers. A rotary filter will separate the crystallized product from the solution. Separate receivers for the crystals, the solution, and the wash solvent will assure maximum efficiency of separation. Acetone recovery from the solution will be accomplished by flashing, stripping, and distilling.

Amides are made by reacting a good grade of fractionated fatty acid with ammonia under high temperature and pressure in an agitated vessel. This operation is still being carried out at Armour's 31st St. plant, but plans are already under way to make amides at McCook.

Quaternary ammonium compounds are being made by reacting amines with methyl chloride or other organic chlorides, also in an agitated vessel under pressure and usually in a solvent. These operations are still at 31st St. also, but a continuous process for their production at McCook is now in the pilot plant stage.

SHIPPING

Finished products are stored in a tank house in steel or aluminum tanks of approximately 11,000 gal. capacity. Fattty acids are kept in the aluminum tanks, and the amines and nitriles are kept in steel tanks. All products are held just barely above their melting point by thermostatically controlled steam coils which are underneath the insulated tanks. As previously mentioned, nitrogen blankets the products in each tank, under approximately 4 in. water pressure. Relief valves on the storage tanks prevent building up of higher pressures. Piping of various products around the plant is facilitated by use of high pressure steam tracers inside the magnesia insulation.

Tank cars are loaded by centrifugal pumps inside the tank house; cars are spotted on a track beside the house. Drum filling takes place in the warehouse building, where the drums are stored prior to truck or rail shipment. In general, the liquid fatty acids, liquid nitriles, and liquid amines are either drummed or shipped by tank car. Pitch residues are also drummed for shipment.

Solid products, particularly the saturated fatty acids, are finished on a chilled flaker roll before going into valve-type paper bags. The amine acetate is packed in open-end drums which are promptly cooled to avoid amide formation. The amine acetate may later be dissolved in water without heating and "losing strength" thereby.

PLANT SERVICES

City water from Chicago is taken off a 20-in. line originally installed for the Defense Plant Corp., but now owned by the village of McCook. The water is chlorinated as it comes into the Armour plant, and it is stored in a 500,000 gal. reservoir. Process water is drawn from about the middle of this reservoir and is maintained at 50 psi. in the plant. A separate water line for fire control is taken off the bottom of the reservoir and is maintained at 105 psi. Numerous hydrants are located around the plant for portable hose truck connections.

Water re-use around the plant is under two separate systems, one for clean water and the other for "oily water." The clean water is used in closed condensers, flaker rolls, and so on. Oily water is used in barometric condensers on the stills and the glycerin evaporator. Separate cooling towers keep these waters at temperatures which are necessary for various cooling operations in the plant. Careful settling and skimming of oils from the process water keeps overflow to the sewer from becoming an objectionable plant effluent.

Fuels used at the plant include coal, oil and natural gas. Storage for the coal and oil is provided appropriately near the power house, the oil coming in by tank cars and the coal in hopper bottoms. The coal is crushed as it comes out of the hopper cars. It is then carried by conveyor into a silo with a capacity of 4½ cars.

Process steam is generated in two 40,000 lb. per hr. boilers, at 200 psi. to supply the high pressure plant lines at 160 psi. City water is used in the boilers after a hot lime-soda treatment. Ash recovery from the boilers includes fly ash separators and ash traps. A pulsating steam jet vacuum system moves the boiler ash to a silo.

Power load in the plant is balanced by switching the boiler feed pumps between an electric motor drive and a steam turbine drive exhausting at 20 psi. The latter is used when 20-psi. steam is needed for heating the buildings, storage tanks and so on.

Electric power is purchased from public service at 33,000 v. This is stepped down to 4,100 v. as it comes into the plant and is fed to two 500 kva. and two 300 kva. substations. Power failure from the outside supply would be met by an emergency generator (steam turbine driven) for stokers, water pumps, and lights in the boiler house. Thus, although the plant would have to shut down in the event of a major power interruption, no serious consequences would arise at the boiler house.

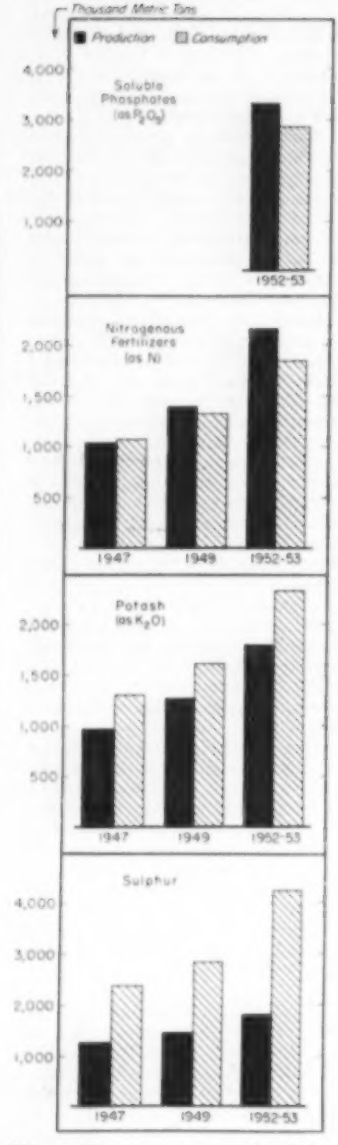
Compressed air for plant use is supplied by steam driven compressor operating at 100 psi. This is used primarily for catalyst regeneration and operation of pneumatic tools. A separate small compressor, motor driven, supplies 60-psi. air for instrument operation.

High pressure steam for the fat-splitter is generated from plant steam condensate in a boiler fired by natural gas and producing 4,000 lb. of steam per hr. at 800 psi.

Thanks for assistance in the preparation of this article are extended the associates of Co-Author Potts, notably Hobart P. Young (his assistant superintendent), Stanley Sivertsen (quality and process control) and O. T. Foster (plant engineer). Photographs are by Aerial Photo Co. (pp. 124-5) and Jay Stevens (Pictured Flowsheet).

World Trade Prospects for 1955: Chemicals Will Have

If you export plastics materials, dyestuffs and by 1955. What's more, European products might



Western Europe can export phosphates and nitrogen, will need potash and sulphur.

ROBERT S. ARIES

The chemical industries of Western Europe have gone through drastic changes during the last decade. Germany, which held first place in chemical exports, has been practically eliminated from world markets. The industries of several countries were destroyed to some extent; the shortage of coal and power did not permit many of them to recover immediately. Some countries not drawn into the conflict (Switzerland, Sweden and Spain) have strengthened their positions.

Our country has done much to help the chemical industry in Western Europe since the end of the war. It has been a case of helping them help themselves, as the European chemical manager is generally well trained and aware of his responsibilities. This help has come from United States (1) construction companies and consulting engineers; (2) chemical companies, who have been open-minded on agreements for technical cooperation; (3) government agencies (such as ECA) who have done a laudable piece of work in the over-all recovery programs of the various countries; without this the recovery of a single industry would have been impossible.

The Western European picture during successive five-year periods could be summarized as follows:

1940-1945: Rapidly shifting production and economic conditions, ending with the virtual elimination of German exports and the diminution of the capacity of several of the other Western European nations.

1945-1950: Healthy recovery, resulting in production which already exceeds the prewar levels by about 50 percent.

1950-1955: A period in which the European chemical industry has excellent possibilities of capturing most of the world markets now served by the United States. With lowered tariffs, it may well compete in our domestic markets.

When we examine the bold plans of the European plastics, sulphur, fertilizer and dyestuffs industries, we should keep in mind that they are only planned, and thus may not materialize entirely. Yet they are indicative of the magnitudes which loom ahead.

When the national fertilizer program is examined, the position which will emerge in 1952-1953 can be seen in the charts. The figures are only approximate, as nations seem to be particularly unrealistic about fertilizer supply and demand.

The following conclusions may be drawn (indicating possible net exports from Europe): (1) nitrogenous fertilizer production in 1952-53 will be 212 percent of that in 1947 while consumption will be 176 percent; (2) potash production in 1952-53 will be 183 percent of that in 1947 while consumption will be 181 percent.

The situation with total sulphur is illustrated by the chart. This excludes Portugal, also a producer. This shows (1) that production in 1952-1953 will be 141 percent of that in 1947 and (2) that consumption in 1952-1953 will be 177 percent of that in 1947. The probable result will be net imports from countries such as the United States.

Trends in the development of dyestuffs are: (1) production in 1947 was 82,000 tons; (2) production in 1952-1953 will be 163,000 tons (of which exports are estimated at 80,000 tons). Estimated production in 1952-1953 would thus amount to 199 percent of

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Our American

To Fight for Foreign Markets

certain other chemicals, you can expect to lose most of your foreign markets even compete in domestic markets. Herewith are the reasons and the figures.

that in 1947. World markets will no doubt feel this export quota.

Production of plastic raw materials may rise from 151,300 tons in 1947 to 476,500 tons in 1952-1953—an increase of approximately 315 percent. Much of this is earmarked for export.

PHOSPHATES—ROCK AND SOLUBLE

The only producer among ECA countries is French North Africa. Output from this area in 1952-1953 is estimated at 7 million tons; this corresponds roughly to the total requirements of the participating countries. It is probable that this estimate will be increased to make it possible to export substantial tonnages to non-participating countries. This estimate of production is equal to about 130 percent of that in 1947. In addition, there will be increased production of higher-content phosphates (65-77 percent of tricalcium phosphate) instead of low-content phosphates (58-65 percent). Thus output will then keep abreast of changes in demand.

The increase in production and the special drive for high-content rock will be achieved by: (1) increasing the output of 75-77 percent Moroccan rock by opening two new modern underground landings and by establishing an open pit; (2) constructing concentration plants in the Tunisian mines so as to raise the total production of 52-63 percent and 63-65 percent grades to 65-68 percent; (3) mechanizing the mines throughout to lower the cost and to make concentration profitable; (4) renewing a major part of the extraction plant; (5) applying new techniques—such as calcium separation—to improve the quality.

If this drive succeeds, it should be possible to abolish by 1952-1953 the purchase of phosphates from the United States. Furthermore, in the manufacture of special products such as phosphoric acid, certain consumer countries and the "Comptoir des Phosphates Nord-Africains" already have schemes in progress for replacing, as far as possible, phosphates from the United States or from Russia with North African phosphates. Low freight costs may, however, continue to make phosphate purchases from the USSR advantageous, for example, to Scandinavian countries.

Table II indicates the figures for each of the participating countries in soluble phosphates. This shows a surplus production of 466,000 tons of P_2O_5. But the question needs closer examination since there are two main groups of soluble phosphates for use on different types of soil: (1) acid phosphates such as superphosphates, nitrophosphates and bicalcic phosphates, and (2) basic phosphates such as basic slag.

Output of basic slag is governed by the production of Thomas steel. Output of the latter, which should amount to about 23 million tons in 1952-1953, will yield 900,000 tons of P_2O_5 as slag. If there is a surplus production, this will be found mainly in superphosphates.

It must be added that some other countries are now putting up plants for producing superphosphates (South Africa) and that some outlets will thus be closed.

SULPHUR

The Western European demand for American sulphur is much greater than before the war (750,000 tons in 1948-1949 against 300,000 tons in 1935-1938). In addition, consumption is increasing about twice as fast as production. The deficit in sulphur in Western Europe may be given in round figures as 2,300,000 tons.

This deficit may be met in several ways: (1) Spain will have about 840,000 tons in the form of pyrites available for export; (2) exports from Cyprus in 1952-1953 can be estimated at 382,000 tons of sulphur in the form of pyrites; (3) Finland and Yugoslavia may also contribute.

Yet the deficit to be met outside Europe will still be in the neighborhood of 1,100,000 tons. This might be reduced if a new pyrites mine in Norway capable of producing about 300,000 tons annually (130,000 tons of S) were opened.

Except for the small tonnage of sulphur used in agriculture, which is almost entirely restricted to those countries with vineyards, almost all sulphur is used in the manufacture of sulphuric acid; of this, a large part goes into the manufacture of superphosphates. It has, however, been seen that there may be a surplus superphosphate output of approximately 466,000 tons of P_2O_5 in 1952-1953. If it is not possible to find outlets for these surpluses, the consumption of sulphuric acid will also decrease and consequently the purchases of sulphur. The price of Italian sulphur is closely linked with Europe's ability to be self-sufficient.

DYESTUFFS

Table IV shows the Western European trend in dyestuffs production. The increase in productive capacity shown would be due to (1) a fuller use of existing capacities (Italy, Bizone), (2) an increase in production of grades already manufactured, and (3) an expansion in the ranges now produced.

Of the 80,000 tons of estimated exports in 1952-1953 (equal to 50 percent of potential production) a part will be absorbed by the European countries, including those which are producers, as it is impossible to manufacture the whole range of dyestuffs. Nevertheless, a major part will be avail-

able for foreign markets. It is of paramount importance to examine the absorption possibilities of these markets and to take into account their plans for equipping themselves as well as the very large production of the United States. Considerable competition will probably result.

PLASTICS RAW MATERIALS

Table V shows the estimated production for 1952-1953. As compared with 1947, the percentage increases in production for the different categories of plastics raw materials are:

	Percent
Phenolic resins	149
Amino resins	227
Vinyl resins	404
Cellulose products	122
Others	246

Despite the increase in production, it is difficult to forecast whether this will give rise to any surplus which the foreign markets would find difficult to absorb or whether there will be any surplus at all. The use of plastic materials is being extended continuously and Europe is catching up with the United States in this respect.

CONCLUSIONS

Far from being "underdeveloped," the fertilizer, plastics and dyestuffs industries of Western Europe have regained their vigor. They promise to provide lively competition to American firms in the export markets. Coupled with developments in other fields of chemistry (such as petrochemicals, of which several plants are now being built in Western Europe) it is reasonable to assume that the countries in the ECA program will require very small amounts of chemicals from the dollar areas. This may cut off the best purchasers of the United States industry, and be a prelude for keen competition in world markets. It is reasonable to assume that the United States will lose a substantial portion of its chemical export markets and, with the continued reduction in tariff barriers, may even face competition in its domestic markets. These conclusions are drawn without commenting on the desirability or undesirability of either the ECA program, the lower tariffs or other broad economic policies of the United States government.

Statistics for this article have been compiled by the Organization for European Economic Cooperation. The Chemical Products Committee has already done a herculean job of collecting and analyzing the maze of material. It is hoped that it will continue to make available its progress reports, change of programs and conclusions.

TABLE I—NITROGENOUS FERTILIZERS

	Production			Capacity Increase		Consumption		
	1947	1949	1952-53	New Plants	Extension	1947	1949	1952-53
Austria	41	61.5	75	0	16.5	30.5	34.6	50
Benelux	518	365	435	70	90	202	198.9	265.5
Denmark	0	0	0	0	0	42.4	43	69
France	145	196	350	60	94	163	254.5	436
Greece	0	0	26	26	0	13	15	42
Ireland	0	0	0	0	0	3	7.2	31
Iceland	0	0	7.5	7.5	0	1.6	2.5	2.5
Italy	76.9	150	240	58.3	31.7	92.3	119.4	160
Norway	62	110	191	0	61	30	34	35
Portugal	0	0	15	15	0	10	20	25
United Kingdom	254	288	287.5	0	27.5	140	172	287.5*
Sweden	19	21	26	0	7	48.9	39	54
Switzerland	13.5	16.1	21.5	0	8.4	12.5	13	9
Turkey	0.5	0.6	0.6	0	0	1.1	2.5	10.7
Rumo	139	220	380	0	150	200	314.8	400
F. Z. O. G.	41	80.5	135.5	0	45	35	50	50
Trieste	.....	1.3	1.3	0	0	.....	0.2	0.2
Total	1,693	1,860	2,186.9	346.8	545.1	1,081.3	1,310.8	1,901.4

In thousand metric tons of nitrogen. *Including British Colonial Territories.

TABLE II—SOLUBLE PHOSPHATES

	1952-53 Program	
	Production	Consumption
Austria	0	56,500
Benelux	655,000	240,000
Denmark	75,000	68,000
France	980,000	800,000
Greece	30,000	30,000
Ireland	35,000	45,000
Iceland	0	1,000
Italy	420,000	330,000
Norway	37,000	37,000
Portugal	51,000	51,000
United Kingdom	447,000	517,000
Sweden	90,000	85,000
Switzerland	14,000	20,000
Turkey	0	10,000
Rumo	437,000	480,000
F.Z.O.G.	43,000	70,000
Total	3,314,000	2,847,500

In metric tons of P_2O_5.

TABLE III—POTASH

	1952-53 Program	
	Production	Consumption
Austria	0	39,400
Benelux	0	262,500
Denmark	0	75,000
France	940,000	700,000
Greece	0	22,000
Ireland	0	18,000
Iceland	0	1,000
Italy	0	40,000
Norway	0	50,000
Portugal	0	8,000
United Kingdom	0	205,000
Sweden	0	60,000
Switzerland	0	25,000
Turkey	0	10,500
Rumo	800,000	720,000
F.Z.O.G.	60,000	100,000
Total	1,800,000	2,360,400
Position in 1960-1961 for Non-Participating Countries		
Russian Zone	980,000	560,000
Spain	200,000	50,000
Israel	55,000	.....
Total	1,245,000	610,000

In metric tons of K_2O.

TABLE IV—DYESTUFFS

	1947 Production	1952-1953 Production Program	1952-1953 Anticipated Exports
Benelux	1,900	6,400	4,500
France	16,000	27,000	10,000
Italy	8,900	20,000	6,000
United Kingdom	54,000	82,000	70,000
Switzerland	15,000	20,000	18,500
Rumo	4,300	20,000	18,000
F.Z.O.G.	4,000	4,300	1,000
Total	94,100	102,700	80,000

In metric tons of commercial product.

HOW TO CONVERT

A metric ton is about 10 percent heavier (2,204.6 lb.) than our short ton. Metric tons × 1.1 = short tons.

TABLE V—PLASTICS RAW MATERIALS

	Phenolics		Amino Resins		Vinyl Resins		Products of Cellulose		Others	
	1947	1952-53	1947	1952-53	1947	1952-53	1947	1952-53	1947	1952-53
Benelux	6.0	12.3	4.2	4.5	1.6	13.6	4.5	10.9	3.7	9.1
France	5.3	12.0	2.8	15.0	4.1	24.0	1.5	6.0	9.4	29.4
Italy	2.9	10.0	2.3	6.0	0.5	4.5	2.2	4.1	1.0	7.4
Norway	0.4	1.0	....	2.0	....	1.0	....	0.3	....	1.0
United Kingdom	24.7	45.0	13.9	45.0	6.5	33.5	7.3	10.0	18.4	82.5
Switzerland	0.4	0.5	2.7	6.8	2.3	2.3	2.6	2.6	2.3	3.3
Rumo	3.5	23.0	0.2	5.0	3.5	20.0	5.0	20.0	3.0	22.0
F.Z.O.G.	0.9	1.1	0.2	0.3	1.3	1.5	3.8	4.0	2.0	2.5
Total	43.1	104.9	26.3	85.6	19.9	100.4	26.3	58.8	38.8	157.2

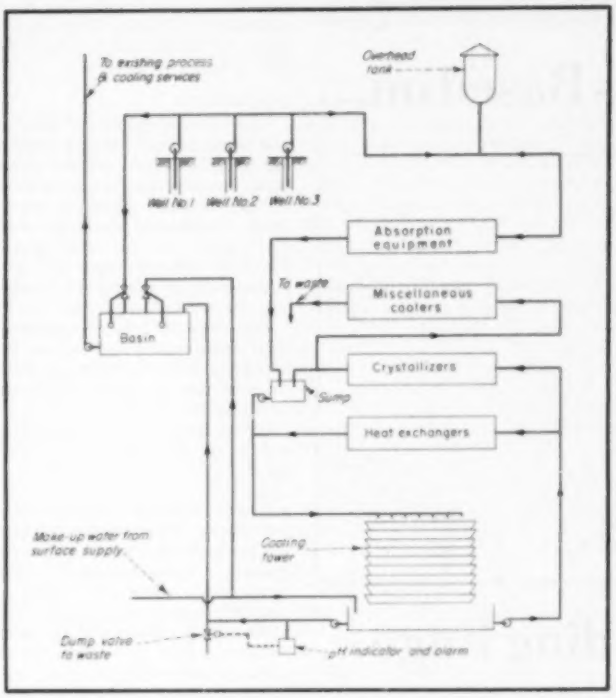
In thousand metric tons of plastic raw materials.

" . . . the fertilizer, plastics and dyestuffs industries of Western Europe have regained their vigor."

DEPARTMENT OF THE MONTH
One of twenty service features in each issue of Chemical Engineering

Quotes, Extracts and Digests

MORGAN M. HOOVER, Assistant Editor



Efficient system for cooling several units having different thermal requirements.

How to Conserve Plant Water

SHEPPARD T. POWELL and A. CHESLEY WILSON

Added to other perplexing problems, industry in all parts of the country now faces more squarely than ever dwindling water supplies in many areas. There are many sections of the country in which the growth of population and the expansion of industry are inhibited solely because of inadequate water supplies. Methods may be applied in industrial plants for effecting substantial savings in water.

Occasionally in industry, there exists a compact arrangement of processes requiring cooling water in which progressively higher temperature of the water is permissible. For example, cooling water may be required for air conditioning, compressors, casting machines and furnace walls. Operations may be arranged in a succession of groups where parallel cooling of units in one group will yield an effluent water at a temperature suitable for introduction into a second group, and so forth. The effluent water from such systems, arranged in series, is usually higher in temperature than that normally applied to cooling towers thus increasing the capacity of the tower.

Where such conditions exist, great economies in water may be obtained. Before such systems are planned, a careful study of plant processing, with due regard to the heat balance of the entire system, must be evaluated and balanced against capital investment and fixed and operating charges.

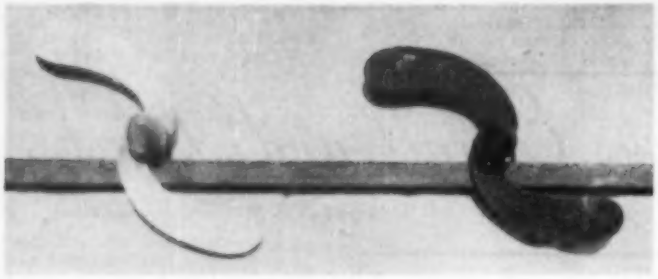
In one plant, having only three wells available, additional water was required to meet expanding operations. The cooling water system was redesigned to form groups of operations using water pumped from one operation to another, thereby utilizing water of various temperatures selectively to meet the thermal requirements of the particular equipment. By changing the design in this manner, the consumption of water was reduced 50 percent. The arrangement used is illustrated by the diagram.

WASHING OPERATIONS

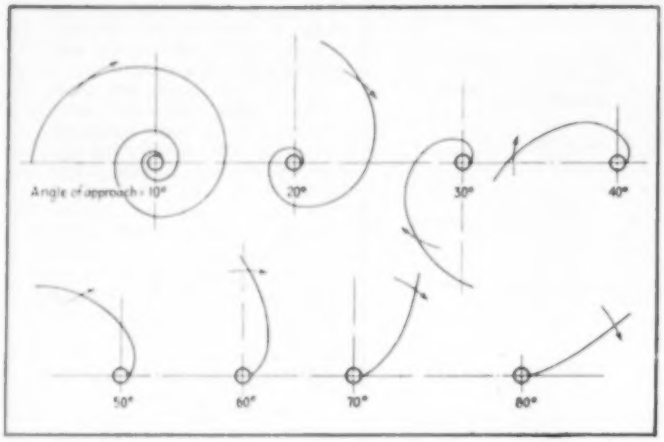
Often recirculation of wash water results in substantial savings. In a carpet manufacturing plant, the wool, after scouring, is dyed in rotary kettles and when removed from these units, it is fed into a rinser where unfixed dyes are removed by washing and discharged to the sewer. The rinsing tank is equipped with reciprocating forks that move the wool through the tank. Most of the free dye was removed in the first 10 percent of the tank. Only traces of color were removed during the remainder of the washing operation. A partition wall was installed in the unit, separating the highly colored from the uncolored water. The latter was recycled by means of a pump. This inexpensive change effected a saving of 80 percent of the rinse water, with no impairment of the quality of the material.

Opportunities for similar savings are many in textile plants. Counter-flow washing is often used. Fresh

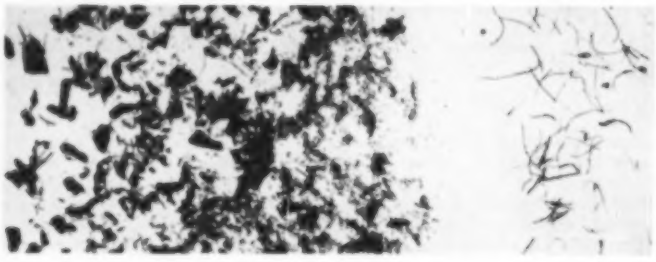
(Continued on p. 239)



New Propellers Based on...



...Study of Leading Edge...



...Chop as Well As Mix

Ability to cut to the desired degree of fineness is combined with the high propulsive efficiency needed for efficient use of power.

W. H. JACKSON

Investigation into the underlying principles of cutter-propellers, undertaken because of the complete lack of information on the subject, has resulted in the discovery of new possibilities for their use, and a practical method of design. Application to the processing of vanilla beans has reduced the number of operations from four to two.

REQUIREMENTS

The cutter-propeller for disintegration must do two things: (1) sever the solid materials present in the liquid medium, and (2) operate with a high propulsive efficiency. For example, chopping by the blades is only one factor in the disintegration. Thereafter efficient agitation causes each particle to rub against its neighbor completing the process.

Extraction of soluble components from cut materials also requires high propulsive efficiency. Frequently the propeller runs long after the severing operation has ended.

It was found in severing material with a propeller that, unlike most attrition operations, a particle is not sheared between two metal surfaces but rather between one metal surface and a liquid. Thus the effect of inertia and the hydraulic pressure perform the operation. This introduces a different effect which can be very useful because it is highly selective as is shown further on. As the size of the particle becomes smaller the inertia and hydraulic pressure factors get less so that at a constant speed of the propeller the minimum size of each material is fixed. Also, particles below this size originally are not affected at all. This is useful in handling vanilla beans as it is not desirable to crush the seeds when cutting them up. This selective factor would also appear to be useful for disintegrating tomatoes and the like for recovering juice, as the seeds and even the cores could be exempt from chopping by the blade.

The essential conditions are a minimum of abrasive particles among the material to be cut and the final product must behave as a fluid even though the

W. H. Jackson is a consulting mechanical and electrical engineer specializing in process equipment, with laboratory at Augusta, Ga. He has had much experience with various types of propellers for process use, and holds patents on propeller agitators.

viscosity is high. Where fluidity is lacking the viscosity at the start can be still higher or, as in the case of tomatoes, it can consist of the whole tomatoes and little or no fluid at all. The action is very rapid. Under the conditions used for vanilla beans the two propeller blade tips make a path two miles long each *minute* and pass a volume through it of from 150 to 200 gal. in the same time. In a unit containing 100 gal. of menstruum and 200 lb. of beans all the beans would go through the propeller every 30 to 40 sec. And this is by no means a limiting condition as all these factors may be greatly increased.

STANDARD PROPELLER: LIMITATIONS

A serious defect of the standard type of agitation blade is that it loads itself with uncut material and then has to be stopped to remove it. This is due to the fact that the blade pattern is generally symmetrical about a radius. The leading edge approaches a particle at an angle of about 80 to 90 deg., which is too great an angle to have any removal effect. (Where the term angle or angle of approach is used in the following discussion, it refers to the angle between the tangent of the curve of the leading edge and the tangent at the same point of the circular path of rotation.)

DESIGN

In starting out to design a propeller of suitable characteristics it seemed desirable to try out the simple idea of making the desired angle of approach just a little greater than the ordinary angle of repose of material sliding down an incline. While it is quite true that many types of particles (such as those that are gummy or sticky) could not be handled so simply, it is also probable that these same particles would not contain fibrous material and could therefore be handled by other types of propellers where inertia effects are greater. It would be desirable to determine this angle by calculation. However, the particles themselves have so many different properties, each of which varies so much (particularly toughness even in a single batch of material), that calculation would be no better than the assumptions made. More accurate results could be expected from making experiments with different propellers each having a constant angle from the hub to tip of the blade. Each propeller would have a slightly different angle of approach. After much experimenting the empirical formula

$$r = \tfrac{1}{2} He \tan(\phi)\theta$$

was developed for the curve of the leading edge; r and θ are the regular polar coordinates with θ expressed in radians. H is the diameter of the hub of the propeller, e is the base of the Naperian logarithms, ϕ is the angle of approach or the angle between the tangent of the curve of the leading edge and the tangent at the same point to the circular path of rotation of this point.

The usefulness of this curve for handling variations of this design is shown on the left by the series of curves at 10-deg. intervals of ϕ, beginning at 10 deg. and going to 80 deg. There is a freedom in this design both as to range of angle ϕ and the hub size. It is convenient that the origin of the polar coordinates and that of the propeller are the same. In the figure the curves from 10 deg. through 80 deg. are all drawn for the same over-all diameter. Each curve has an arrow drawn through it which indicates the direction of motion at that point. The number of degrees of the angle ϕ, shown under each curve is the acute angle between the arrow and the curve. The 10 deg. and 80 deg. curves are of course extremes but they serve to show that even in the extreme ranges the formula is still fully effective. The 60 deg. curve makes a propeller that chops very lightly and does not pick up anything, even cord in lengths, but it suffers from poor propulsive efficiency. The 30 deg. curve makes a propeller that is just the reverse. It is most efficient in propulsive power and chopping but it picks up anything of a fibrous nature that is not cut.

While vanilla beans could be handled with less than 45 deg. for ϕ, it was the tendency in handling large amounts of beans for the binding cord around the bundles of beans to get into the mixer and wrap around the hub for values of ϕ less than 45 deg., so that the resulting efficiency of the 30 or 35 deg. propeller was less with the string on it than the 45 deg. propeller which remained free from adherent material of any nature. In fact this blade remained clean and functioned perfectly without cleaning after chopping ton after ton of beans with no binder cord becoming entangled on the propeller or in the beans after the operation. This propeller (45 deg.) is shown at the top along with its pattern which has a recess in its leading edge to receive a hard cutting edge material.

A photograph of the disintegrated vanilla beans is shown below. The total weight of all the particles is ¼ gram. One hundred of the long fibers have been withdrawn to one side to make their disintegration pattern clear. There are several hundred more of these fibers, mostly somewhat shorter in the main lot. Observation of many such lots indicates that these fibers would run not less than 250,000 per lb. of beans. Prolonged agitation (72 hr.) fails to show any appreciable difference in the length, showing that the fibers are not further severed.

FOUR OPERATIONS CUT TO TWO

As a result of the way these beans were disintegrated it was found that up to two pounds of them per gallon of menstruum, after 15 to 40 hr. of agitation, could be handled through ordinary pipes, valves and pumps for delivery to other operations. A large hydraulic press was made which was totally inclosed to receive the beans and the menstruum. This was so designed that as the solids compacted themselves on the strainer, pressure was applied and a pump recirculated the pressed extract back through the cake of beans until it was clear. Continued pressure by the press after that resulted in a perfectly clear product to the very end. The beans were thus utilized to filter the extract derived from them and they were pressed dry at the same time. The four normal operations of cutting, percolating, pressing and filtering partly in an open system, were thus reduced to two operations by means of this agitator. The cutting and percolating goes on simultaneously in a unit and the pressing and filtering is done in one machine and at the same time, and all in a completely closed system. The essential feature of a propeller to do such work is to control the angle of collision ϕ from the very beginning of the blade at the hub out to the end of the blade and make it constant the entire length. In this way the blade will depart from the more efficient shapes as little as possible.

OTHER POSSIBILITIES

Analogous processes, such as botanical drug, tomato, and fruit juice extraction lend themselves to the use of the cutter-propeller.

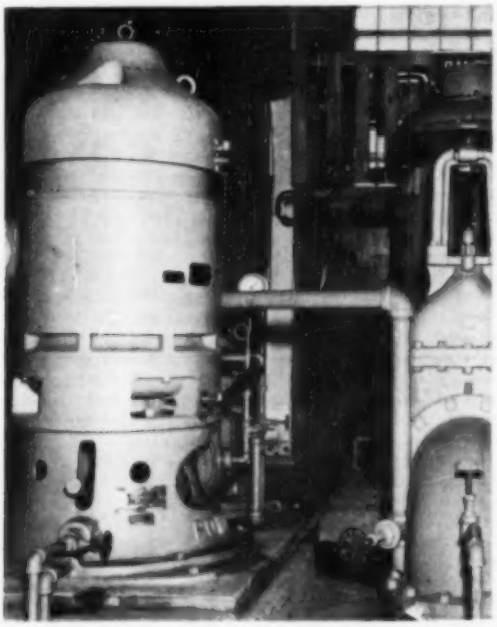
It appears to have application in other fields for the wet disintegration of material. For instance, it has always been troublesome to incorporate dusty materials into a mixing batch, as with the introduction of diatomaceous earth. If the incorporation of the paper container in the mix would not be objectionable (as when filtration follows), the whole paper bag of material could be dumped into the mixer provided that the bag, or at least the liner, were made of a suitable stock such as newspaper print which disintegrates in 15 to 20 min. to its original fibers.

How Calco Planned a Plant For Future Expansion

They knew when they built their Willow Island plant that it would have to be bigger someday. So they planned a plant that could grow—with minimum expense and minimum interruption.

MORGAN M. HOOVER

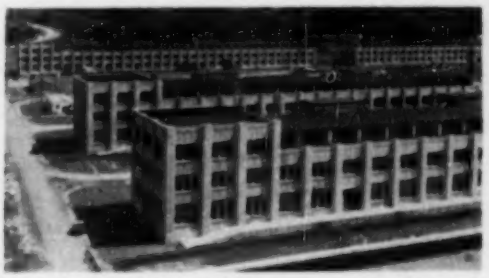
The Willow Island Plant of the American Cyanamid Co., Calco Chemical Division, near Parkersburg, W. Va., started operations Oct. 15, 1947. Currently in production are melamine for melamine-urea and melamine-formaldehyde resins, folic acid, iron blue, and a stilbene dye used as a textile brightener. Chrome yellow and chrome green have almost reached the production stage. Eventually Calco expects to add substantially to Willow Island's roster of processes—some stemming from research, some moved down from other Cyanamid plants. Anticipating these additions, they built the plant so it would be easy to enlarge. Process highlights of this versatile plant will appear soon in *Chemical Engineering;* for the moment we are interested in the steps taken to prepare for painless expansion.



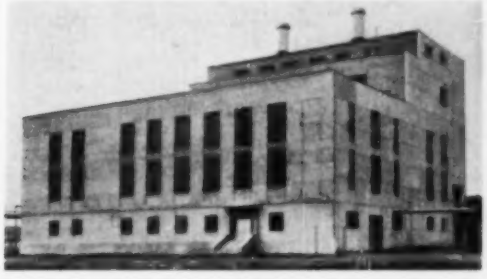
FUTURE WATER REQUIREMENTS may be as high as 20,000,000 gpd. Plant water is obtained from Ranney wells adjacent to the Ohio River, one of which is shown here (interior view at right). Calco has just completed the purchase of a small island which will insure future needs of an expanded Ranney well system. The wells are caissons 15 ft. in diameter extending 45 ft. down to a permeable gravel bed. There is a three month's lag in temperature; i.e., the warmer summer river water takes three months to filter through the gravel bed before the rise in temperature is noted at the well. The water is sparkling clear, relatively cool, and of constant chemical composition. Large, slower speed pumps (125 hp., 1,760 rpm., 150 gpm.) were selected rather than smaller, high speed pumps to minimize leaching of soluble materials in the gravel bed and to get a steadier supply of water. All water to the plant is chlorinated. Therefore water drawn at any point in the plant is potable.

MORGAN M. HOOVER *is* Chemical Engineering's *freshman staff member. By coincidence his first plant assignment took him back to Cyanamid, his former employer.*

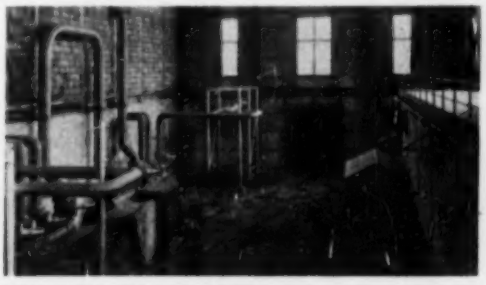
EXTRA LARGE, EXTRA DEEP. One-third of the plant investment is underground. Service piping, including this sewer pipe, is all sized to take what will be added later; unnecessary additional piping will be avoided. "Trunks" of the various systems are in place and in some cases headers have been run right up to where standard buildings will be built later. This construction photo shows sewer pipe being laid 25 ft. below ground level, beneath all other piping. Purpose: avoid corroding other service piping by any acid leaks from the sewers.



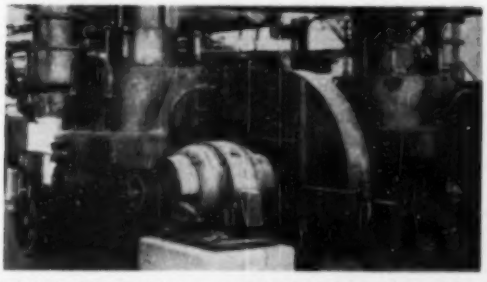
STANDARDIZED BUILDINGS are used rather than functional types. The planning allows for as many as 36 of these buildings. There are five at present. Advantages of standardized buildings: (1) Over the years processes and equipment will undergo changes; it is much easier to change equipment in a standard building. (2) This type of building lends itself to the layout of service piping to meet future needs. (3) Once one unit is designed, the design cost is over. (4) The cost of comparatively expensive concrete forms is distributed over many buildings.



EXPANDABLE BOILER HOUSE. Wall on the right is temporary, easily removed to make boiler house longer. Inside are two 100,000 lb. per hr. boilers with layout arranged for four times this capacity. Design pressure is 900 lb., although only 150 lb. steam is generated at present. High pressure design provides for future high temperature operations and generating of power. Some $20 million are invested in the boiler house.



PROVISION FOR TURBINES. The 900-lb. steam piping shown here will connect to turbines (when installed in the aisle above) for the purpose of generating power for plant consumption. At present it is more economical to purchase power. Capacity will probably go eventually to 15-20,000 kva. 900-lb. steam will exhaust to 150 lb. through the turbines, with the 150-lb. steam going into process use.

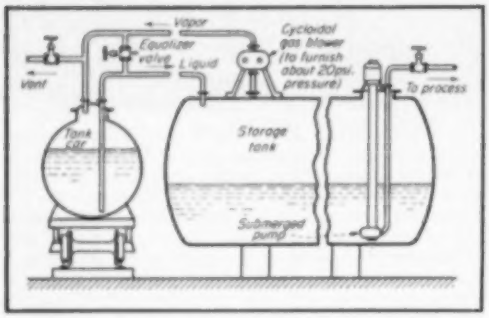


READY FOR COAL. Coal pulverizing and handling equipment (shown here under construction) will be ready and waiting for the day when the steam load reaches the point where it will no longer be more economical to use natural gas in the boiler house. Present minimum load is low enough to cause loss of ignition were coal used for both of the 100,000 lb. per hr. boilers.

FUTURE WASTE BASIN. Settling basin for waste effluents has already been built anticipating the time when chemical treatment will become necessary. At present acid and alkaline wastes neutralize each other and solids settle out in another huge earth-bank basin of 25,000,000 gal. capacity. $500,000 has gone into the effluent treatment plant up to this point.

The Plant Notebook

THEODORE R. OLIVE, Senior Associate Editor



Compression of Own Vapors Helps to Unload Fuming Liquids From Cars

HAROLD F. REICHARD, *Chemical Engineer, Milltown, N. J.*

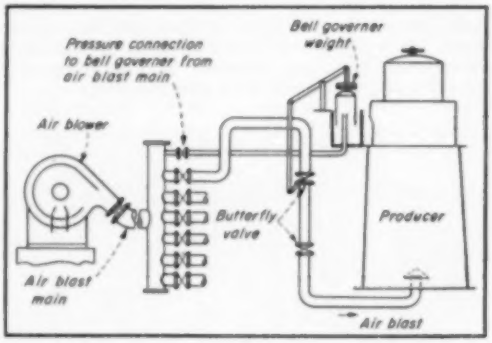
★ **November Contest Prize Winner**

With few exceptions, toxic, corrosive and flammable liquids cannot be shipped in tank cars in interstate commerce if the car has a bottom outlet. Particularly in the case of fuming liquids such as oleum, anhydrous hydrofluoric acid and fuming nitric acid—and with volatile solvents as well—this means that unloading through the dome is likely to be difficult.

In unloading these high-vapor-pressure liquids by transfer systems employing a pump or vacuum, "nursing" in the form of ice or cold water applications to the suction pipe is required at summer temperatures to prevent vapor formation. To get around this difficulty some plants use compressed air or nitrogen applied to the tank car to unload the liquid, but in that case there is usually a problem in disposing of the vapors displaced from the storage tank by the incoming liquid. Such vapors are often costly, toxic, corrosive or flammable, or they may have other properties which demand a considerable expenditure for the installation and operation of stacks or absorbers.

The improved system diagrammed in the sketch above gets around all of these problems. Using a comparatively low cost compressor of the cycloidal type to generate a pressure of about 20 psig., it withdraws vapors from the storage tank and compresses them to force incoming liquid from the tank car into the tank. It operates in a closed circuit and when the discharge of the carload is complete, it is necessary only to shut off the blower and open the equalizer and vent valves before the lines are disconnected.

Use of this system completely eliminates interruptions caused by vapor formation, regardless of the ambient temperature. Furthermore, the amount of gas to be vented is negligible which means that there is no displaced vapor to be absorbed.



Automatic Valve Protects Producers Against Power Failure

C. PHILIP CHACKO, *The Fertilizer & Chemicals, Travancore, Ltd., Alwaye, Travancore State, South India*

At this unique fertilizer plant, which has been described by Van Denburg (*Chem. Eng.*, Aug. 1947, p. 92), producer gas from wood is used to make the hydrogen and nitrogen required for the ammonia synthesis process. In operating these producers, serious explosions may occur as a result of the gas flowing back into the air blast main when the power fails. A simple arrangement is used to close a butterfly valve in the air blast main when a power failure does occur, and this effectively circumvents the hazard. Automatic operation was chosen in the fear that manual operation would not be quick enough.

★ **JANUARY PRIZE WINNER**—A $50 prize will be issued to . . .

SHELDON JACOBS
Chemical Engineer, Chicago Div. of Water Purification, Chicago, Ill.

. . . for an article describing a simple type of variable-head, constant-feed-rate tank particularly suited for handling slurries, which has been judged the winner of our January Plant Notebook contest. It will appear in the March Plant Notebook.

$50 PRIZE FOR A GOOD IDEA—Until further notice the Editors of *Chemical Engineering*, will award $50 cash each month to the author of the best short article received that month and accepted for publication in the Plant Notebook.

The winner each month will be announced in the issue of the next month, e.g., the February winner will be announced in March and his article published in April. Judges will be the Editors of *Chemical Engineering*. Non-winning articles submitted for this contest will be published if acceptable at our usual space rates.

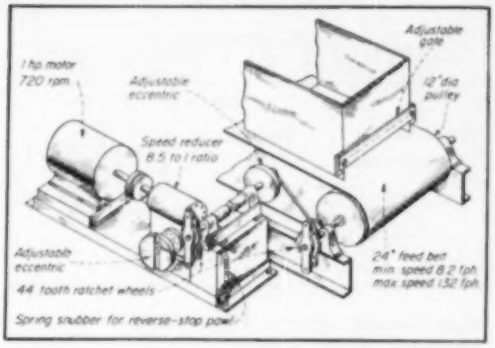
HOW TO ENTER CONTEST—Any reader of *Chemical Engineering*, other than a McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable material must be previously unpublished and should be short, preferably not over 300 words, but illustrated if possible.

Articles may deal with any sort of plant or production "kink" or short-cut that will be of interest to chemical engineers or others in the process industries. Also, novel means of presenting useful data, as well as new cost-cutting ideas, are acceptable. Address Plant Notebook Editor, *Chemical Engineering*, 330 West 42nd St., New York 18, N. Y.

How the system works is shown clearly in the sketch. A bell governor provided with a pressure connection from the air blast main operates the butterfly valve. When the blower is operating, its pressure raises the bell and this in turn, through the connections shown, opens the butterfly. Blower pressure tends to be quite steady so that normally the butterfly remains in the full open position when the blower is running. As soon as power fails, however, the main pressure falls to zero and the dropping of the bell quickly closes the butterfly.

So far as sizes are concerned, these will vary somewhat depending on conditions. A 12-in. diameter bell will suffice, although the size can be varied according to the expected blast main pressure. With 12 in. water pressure in the main, a 12-in. bell will support considerable weight with the butterfly in the full open position.

Pressure connections to the bell must not be too small if satisfactorily rapid closing is to be obtained. A 1½- or 2-in. pipe will be large enough for the purpose and will enable the weighting of the bell to accomplish the desired rapid closure when a power outage occurs.



How to Achieve 1,900 to 1 Reduction for Feeder

A. R. Fowler, *Chemical Engineer, Niagara Falls, N. Y.*

Speed reduction over a very wide range usually requires expensive equipment. This article shows how two simple ratchet drives of standard design were used in series to provide a reduction of 1,900 to 1 at extremely moderate cost.

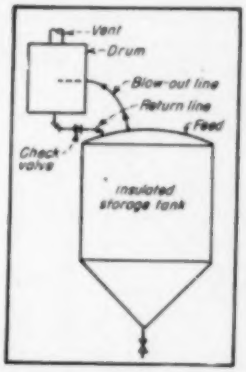
There are many ways in which the feed rate to a rotary kiln can be controlled, but in this particular case, the usual methods did not seem to be applicable. A batch mixing operation preceded calcining, which meant a storage hopper was required. Due to limited head room and the "sticky" nature of the material, it was determined that the hopper should be straight-sided, long, and shallow, with a 24-in. moving belt as its bottom. With an adjustable gate at one end of the hopper, and with a method of controlling belt speed, the feed rate from the batch hopper to the kiln could be adequately controlled. Calculations showed, however, that the speed reduction from the motor to the belt pulley would need to be in the order of 5,500 to 1.

The solution is shown in the accompanying drawing. A 1-hp., 25-cycle, 720 rpm. motor drives a standard-make worm gear reducer, which has an 8.5 to 1 ratio. The first ratchet is driven by means of an adjustable eccentric. This in turn drives a second eccentric-ratchet combination. The second ratchet drives the 12-in. diameter belt pulley.

Each ratchet has 44 teeth and the eccentrics are adjustable so that one, two, three or four teeth may be advanced with each revolution of the eccentric. (The eccentric-ratchet assembly, complete with pawl and drive arm, is available from the Schutz-O'Neill Co., Minneapolis, Minnesota, and is described as "parts for 20-in. breaker feeder for Limited Mill.") The speed reduction in one ratchet drive is therefore variable from 11 to 1, up to 44 to 1, in three steps. With two ratchet drives, the maximum speed reduction is 1,936 to 1, while the minimum is 121 to 1.

With the arrangement shown here, the over-all reduction from motor to belt pulley is variable from a minimum of 1,030 to 1, up to a maximum of 16,400 to 1, in nine steps. With the 12-in. pulley, the belt speed can be varied from 8.2 ft. per hr., up to 132 ft. per hr. This installation is operating at a belt speed of 24.8 ft. per hour, with the hopper gate opened to an area of 0.403 sq. ft., giving a uniform feed rate of 10 cu. ft. per hr. For the product in question this corresponds to 750 lb. per hr. kiln feed rate.

The action of the drive is to move the belt pulley only while both ratchet pawls are advancing, the pulley remaining stationary while either pawl retreats. With each stroke of the first pawl, the second pawl advances the pulley only a small fraction of an inch. There was enough resistance to flow of the material from the hopper that the pulley returned to its initial position as soon as the first pawl released itself for the return stroke. It was therefore necessary to mount a second pawl on the ratchet wheel to prevent this oscillation of the belt pulley. This reverse-stop pawl is snubbed by means of a spring attached to a rod welded to the pawl, and its action nicely prevents "missing" of the drive pawl.



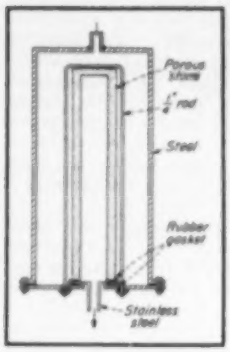
Separating Drum Prevents Foam Loss in Mixing Hot and Cold Liquids

R. L. Miller
Kamen Soap Products Co.
Barberton, Ohio

In pumping cold liquids into hot it is not uncommon to get violent foaming and carry-over through the vent pipe. The device shown in the sketch has controlled this occurrence effectively in our plant.

For design purposes the blowout line should be 1 in. in diameter for each foot of tank diameter, while the return line should be half the diameter of the blowout line. The vent should be twice the size of the blowout line. A suitable size for the separating drum is ¼ to ½ the diameter of the tank, while the blowout line should enter it tangentially half way up. The arrangement of drum and drain line must be such that the drum will drain. Although the tank may be insulated, the drum should not be, so that it will act as a condenser. If the material is one that will solidify, the return line should be insulated to prevent freeze-ups.

(*Continued*)



Porous Alundum Tube Makes a Corrosion Resistant Filter

C. W. Dunbar
Chemical Engineer
Carolina Magnovine Co.
Waynesville, N. C.

In handling fine chemicals it is often necessary to procure corrosion-resisting equipment to prevent contamination of the product. Such equipment is generally expensive. A filter constructed as shown here involves a minimum of expense, yet gives excellent corrosion-resistant service.

Our problem was to filter a brine containing a small amount of flocculated iron, and prevent the brine from picking up further iron. The filter shown accomplished this purpose. It consists of a porous alundum tube discharging through a stainless steel nipple. After passing through the porous tube the brine does not contact iron again and thus a minimum of corrosion-resisting material is needed. The most expensive item used was the alundum tube which was obtained from the Norton Co. for $12 in the 4 x 30-in. size. As many tubes as necessary can be used in parallel to give the needed capacity. By precoating, any desired fineness of filtration can be secured.

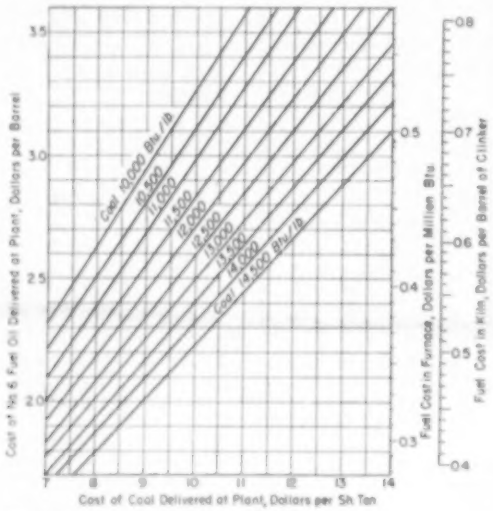

Cost of No 6 Fuel Oil Delivered at Plant, Dollars per Barrel
Cost of Coal Delivered at Plant, Dollars per Sh Ton
Fuel Cost in Furnace, Dollars per Million Btu
Fuel Cost in Kiln, Dollars per Barrel of Clinker
Coal 12,000 Btu/lb
13,500
13,000
12,500
12,000
11,500
11,000
10,500
Coal 10,000 Btu/lb

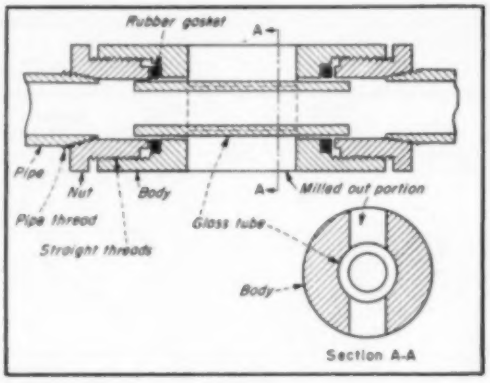
Chart Gives Comparative Costs Of Coal and Oil Fuels

Robert C. Reid, Partner, Knowles Associates, New York 6, N. Y.

Many plants are equipped to burn either fuel oil or coal, and to change from one to the other, depending on their relative costs. The chart above has been designed to make it easy to determine which fuel at any time gives the least cost per million Btu. To take care of the fact that the cost of handling the two fuels in the plant differs, the chart adds $0.50 a ton to the delivered cost of coal, and $0.05 a barrel to the delivered cost of oil. This means, for example, that if oil delivers for $2 per barrel, the cost per million Btu. should be calculated for a total cost of $2.05 per barrel.

The chart is based on 42-gal. barrels of No. 6 fuel oil of 12 API gravity, weighing 8.2 lb. per gal. Heating value of the oil is taken at 18,300 Btu. per pound.

It is easy to modify the chart to give fuel cost per unit of product, rather than cost per million Btu. As an example, the chart shows also the fuel cost in the kiln per 376-lb. barrel of cement clinker, assuming that 1,400,000 Btu. is required per barrel of clinker.



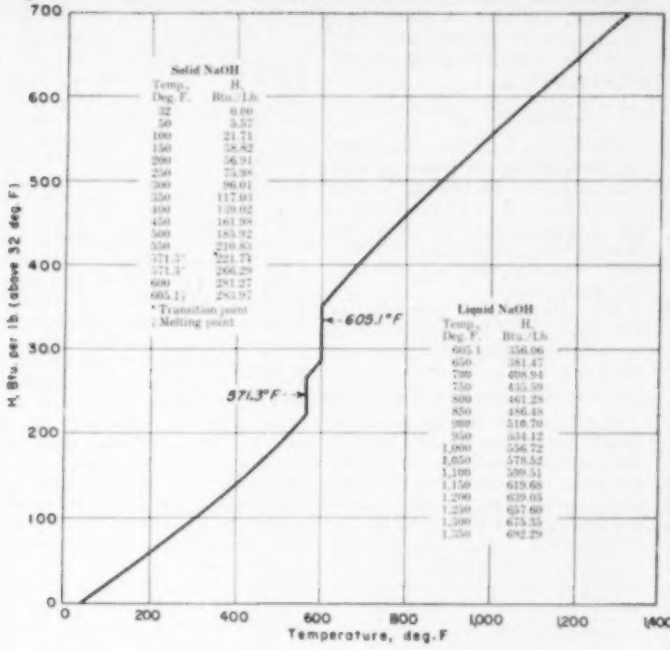
Sight Glass Makes Flow Visible Through Pipe Line

W. G. Thomson, Minneapolis, Minn.

Since it is often desirable to be able to see the flow of process material through a pipe line, here is a design for a sight glass that can easily be constructed in the plant shop. The design has several advantages. In the first place, it is extremely sturdy, the ends of pipe being connected with metal parts. The glass tube itself is cradled in rubber, so that if there are strains in the system, the rubber will give and the glass will not be broken. The design allows a light to be mounted behind the opening in the body, so as to permit strong illumination in the glass tube. Finally, the system can be made corrosion resistant by using any suitable metal such as stainless steel for the metal portions, with polyethylene for the washers. In this case the nut and body should be tightened slowly after a period of heating to 185-205 deg. F., since rapid tightening of the joint without first warming the polyethylene washers may crack the glass tube.

Construction is largely evident from the drawing. It will be noted that the nut is screwed and tightened on to the pipe end by means of a pipe thread. A second set of machine threads on the nut allows the nut to be screwed and tightened into the body of the sight glass, so as to compress and distort the rubber washer against the glass tube and make an effective seal. It is clear that both the pipe joint and the joint between glass and body can thus be made tight and that the construction presents a completely sealed system.

Heat Content of Anhydrous NaOH



Here are data—for the first time in the English language—that will help caustic manufacturers calculate concentration efficiencies

RICHARD E. HULME

NOTE: *It is a sad state of affairs when American engineers must go to German or Russian literature for the tools they need for everyday work. Author Hulme decided to do something about it.*—EDITOR.

THERE is little information in the literature on the specific heats and enthalpy or heat content of solid and molten caustic. In fact, the author was able to find three references; only one was in English. The earliest reference was to Blumcke[1] whose work was done in 1885. This was followed by an article by Goesta Angel[2] in 1927. In 1937 the Russians V. P. Terachkevich and A. H. Vishnevskii published an article[3] on the results of their work. The first and last references are to original experimental work, while Angel presents a method of calculating total heat requirements for concentrating caustic.

The purpose of this article is (1) to supply information on the specific heat of solid and molten sodium hydroxide and (2) to help clarify, if possible, a rather confused literature on the subject. All information available has been subjected to a critical analysis in an effort to establish the best values for these properties. The resulting data on the total heat content of solid and molten caustic should form a basis by which we may determine more accurately the actual heat requirements in the various stages of caustic manufacture. Without such information we can only approximate the true efficiencies realized in the various concentration steps used in industry to produce solid caustic.

Terachkevich and Vishnevskii[3] refer to tests and heat balances, worked out by a Russian engineer Yu. I. Sabchuk with Don Soda, who pointed out that according to his tests "the heat capacity of the molten caustic must not exceed 0.57-0.60." It is probable that many of the alkali companies have run similar tests at one time or another without publishing the results. Usually the figure they were interested in was the over-all fuel consumption. T. P. Hou[4] gives an average figure of 0.50 ton of coal per ton of caustic for this figure which includes all losses. This figure is confirmed by a number of plants as being substantially correct. However, such over-all fuel consumption figures do not throw much light on the actual heat required either to boil off the water or heat up the molten caustic for settling, shading, etc. An analysis by the writer of some test data on a gas fired pot installation, indicates that Sabchuk is substantially correct in his maximum figure on the specific heat of molten caustic.

After a study of the available data in the literature, the information by Terachkevich and Vishnevskii[3] was selected as being the most reliable. These authors made a number of calorimetric determinations of the total heat content on five different samples of caustic with sodium carbonate contents which varied from less than 2 to 19.7 percent. These measurements give the total heat content above a mean temperature level of 22 deg. C. Nine such measurements were made on each of two samples designated as Nos. 1 and 2, which are the only runs of interest to us.

Since total heat content was measured at a number of starting temperatures a plot of this data gives an enthalpy vs. temperature curve directly. By differentiating the enthalpy-curve we obtain the specific heat curve for molten caustic. It was found that an equation of the form $C_p = a - bT$ gave a reasonable fit when integrated and compared with the original data.

English units are given throughout which necessitates the conversion of the original data, which was, of course, given in metric units. It was also thought desirable to convert to 32 deg. F. as the base temperature for an en-

R. E. HULME, *of Diamond Alkali's research laboratories, gives you some more basic data. In last year's January and November issues he covered the thermodynamic properties of chlorine.*

thalpy tabulation. Hence, it became necessary to calculate the heat content of caustic between 32 and 72 deg. F. which corresponds to approximately 22 deg. C. This requires a specific heat equation for solid caustic. We can calculate the specific heat of solid caustic at room temperature by Kopps rule. This had already been done by Terachkevich and Vishnevskii obtaining a value of 0.32 cal. per deg. C. per gram (Btu. per deg. F. per lb.). In making this calculation they used a value for sodium of 6.4 rather than the value of 6.2 recommended by Dulong and Petit. Their reasoning seems sound—so the writer accepts their value of the specific heat as a starting point. A total heat content at the melting point can be calculated by using the equation derived for the enthalpy of molten caustic.

The latent heat of fusion, 1,602 calories per mol as given by Hevesy[6] was used. In English units this gives 72.09 Btu. per lb. This brings us to a point that has been overlooked by most workers with caustic: solid caustic exists in two physical forms, the alpha or high temperature form and the beta form. The heat of transition from one form to the other is an appreciable figure. Gmelin: Natrium[7] lists 990 cal. per mol for this figure which is also the figure listed in Bichowsky and Rossini.[8] Converted to English units this amounts to 44.55 Btu. per lb. The temperature at which this change of form takes place is listed as 299.6 deg. C. (571.3 deg. F.) by Hevesy[6] who also gives the melting point as 318.4 deg. C. (605.1 deg. F.). It will be apparent that the temperature difference between these two phenomena is not large. Hence, we will not be introducing an appreciable error by assuming the same specific heat equation applies on both sides of the transition point. Deducting the latent heat of fusion and the heat of transition from the heat content at the melting point gives a figure which represents the sensible heat content of the solid due to the change in temperature above the base temperature.

In order to satisfy both Kopps rule at room temperature and the sensible heat content as indicated above it is readily apparent that the specific heat of solid caustic must increase with temperature. The simplest assumption and one that conforms to our knowledge of other solids, is to assume the specific heat varies in a linear manner with temperature. This results in the following equation for the specific heat of solid caustic between 32 deg. F. and the melting point:

$$C_p = 0.306 + 0.00039\,(T - 32) \qquad (1)$$

where C_p is the specific heat at temperature T in deg. F.

By integrating Eq. (1), we obtain the enthalpy equation for solid caustic at atmospheric pressure, remembering, of course, that we must add the heat of transition at all temperatures between the transition point and the melting point.

$$H = 0.306\,(T - 32) + 0.000195\,(T - 32)^2 \qquad (2)$$

Solving Eq. 2 for the temperature increments in the accompanying table (see cut) gives the enthalpy or heat content figures for solid caustic up to the melting point. We, thus, find that the heat content of liquid caustic at the melting point is 356.06 Btu. per lb.

The specific heat equation for molten caustic referred to above as applying above the melting point or 605.1 deg. F. is as follows:

$$C_p = 0.572 - 0.000324\,(T - 605) \qquad (3)$$

It will be seen that the maximum specific heat by this equation is 0.572 at the melting point. This agrees with Sabchuk's observation that the maximum specific heat of molten caustic must not exceed 0.57 to 0.60. Integrating Eq. (3) gives an equation expressing the change in enthalpy of molten caustic above the melting point.

$$\Delta H = 0.572\,(T\text{-}605) - 0.000162\,(T\text{-}605)^2 \qquad (4)$$

Solving Eq. (4) for various temperatures gives the data for compiling the liquid caustic half of the table. In order to compare the calculated heat content values with the original data a second table was prepared. The experimental values of Terachkevish and Vishnevskii were converted to English units and the enthalpy resulting from the change in base temperature (12.552 Btu.) was added to bring both sets of figures to the same basis for comparison. It will be seen that with the exception of one point, the calculated values are in satisfactory agreement with the experimental data.

Comparison of Calculated and Experimental[5] Values of Enthalpy of Caustic

Temp. Deg. F.	Enthalpy, Btu. per Lb. Calc.	Exp.	Deviation
	Sample No. 1		
651.2	382.14	382.20	−0.06
665.6	390.13	390.12	+0.01
687.2	401.99	401.77	+0.22
764.6	443.22	442.77	+0.45
793.4	458.07	463.74	−5.67
937.4	538.20	539.57	−1.28
941.0	539.96	539.57	−0.61
1,065.2	584.98	583.69	+1.29
1,106.6	602.22	602.05	+0.17
	Sample No. 2		
674.6	305.86	308.80	−2.94
770.0	446.03	445.09	+0.94
840.2	481.03	486.08	−4.45
959.0	538.25	537.34	+0.91
1,036.4	572.67	569.87	+2.80
1,045.4	576.55	575.23	+1.32
1,113.8	605.16	595.21	+9.91
1,193.0	636.39	638.21	−1.82
1,196.6	637.76	641.04	−3.28

It we disregard the one bad point, the sum of the plus deviations is 2.14 and of the minus deviations 1.95 and their difference is plus 0.19. While the equations were derived to fit the experimental data designated as Sample 1 by Terachkevish and Vishnevskii which contained about 99 percent NaOH, a further comparison with their data on Sample 2 for which they gave a sodium carbonate content of 3.92 percent and an NaOH content of 96 percent was thought to be instructive, therefore, another table was prepared. It will be seen that although the deviations are wider, the data on Sample 2 in general confirm the basic equations derived for Sample 1. The difference between the sums of the plus and minus deviations is plus 0.75 Btu. in this case. While we would expect the addition of sodium carbonate to reduce the specific heat of the mixture the magnitude of the deviations in this instance is greater than the expected effect of the additive, but the difference in deviations is in the direction expected. The other data by these authors on samples with greater carbonate content do show the expected reduction in specific heat due to adding sodium carbonate.

The author calculated three average specific heat values from data on a commercial pot operation which used natural gas as a fuel. A comparison of these three specific heat values with values calculated by means of Eq. (3) indicates that we may use Eq. (3) with a reasonable degree of confidence.

Observed		Calculated	
Deg. F.	C_p	Deg. F.	C_p
733-773	0.521	753	0.534
773-828	0.493	800	0.509
828-872	0.453	850	0.482

For the observed run data a heat loss figure had been determined at 800 deg. F. Hence, we would expect the figures on either side of this temperature to be subject to an unknown correction for heat capacity and lag in the furnace setting, as well as a change in heat loss due to temperature change. In view of the inherent uncertainties in industrial measurements of this character these results are considered as constituting a good check on the laboratory results.

Angel[9] has indicated how data such as appears in our first table may be used to calculate the heat required to concentrate caustic solutions. His extrapolation of Blumcke's specific

heat data is questionable, however, for he arrives at a mean specific heat of 0.9 which it will be seen is untenable. However, by ignoring other heat effects such as the heat of transition this error is partially compensated for. It should be remembered that Angel's data were very meager and that neither the reference used here nor the work of Wilson and McCabe[9] was available to him at the time he wrote his article. Furthermore, Blumcke himself states that the accuracy of his measurements was "low" because of experimental difficulties.

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[6] Heveay, *Z. Phys. Chem.*, 73, 681, 1910.
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[9] Wilson & McCabe, *Ind. Eng. Chem.*, 34, 558-66, 1942.

Liquefied Petroleum Gas Sales—1949

Domestic	**...up 12% to...**	**1,650,000,000 gal.**
Chemical mfg.	**...up 6.9% to...**	**525,000,000 gal.**
Industrial & misc	**...up 0.3% to...**	**310,000,000 gal.**
Gas mfg.	**...up 1.0% to...**	**240,000,000 gal.**
Total	**...up 8.5% to...**	**2,725,000,000 gal.**

K. W. RUGH and E. O. MATTOCKS

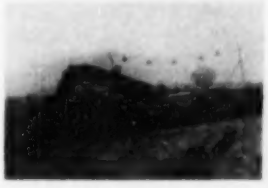
It is estimated that during 1949 the total volume of liquefied petroleum gas marketed in the United States was 2,725,000,000 gal. The industry continues its steady growth of increased sales.

The 8.5 percent increase in sales—low when compared with the past few years—was due to (1) mild weather in the 1948-49 winter, (2) many new natural gas transmission lines.

DOMESTIC consumption of LP gas reached 1,650 million gallons. It is estimated that 6,500,000 homes use liquefied petroleum gas service in farms and suburban homes beyond the gas mains.

The increase of 12 percent over 1948 represents increased demand from present consumers for additional gas appliances and the demand from new customers for LP gas for cooking, water heating, refrigeration and space heating. These more than offset the decreases in demand during the heating season caused by the mild winter throughout the areas where LP gas is used for space heating.

CHEMICAL industries continued to accept liquefied petroleum gas as a raw material for the production of chemical intermediates. A number of plants under construction or just completed in 1948 have been on stream during most of 1949.



INDUSTRIAL use of LP gas in 1949 is estimated at 310,000,000 gal. During the year many industrial plants turned to LP gas as their major source of fuel. In addition, as natural gas lines were extended, making natural gas available to many industrial plants, some of these plants installed LP gas standby installations. These serve as the fuel supply during emergencies when the natural gas supply is interrupted, or during winter months when household and industrial plant space heating requirements cause curtailment of natural gas supplies normally available for manufacturing purposes. The continued demand for LP gas—either for constant use or standby use—indicates a continuing expanded market for LP gas to industrial plants.

GAS MANUFACTURING, it is estimated, used 240,000,000 gal. of LP gas in 1949. This represents an increase of 1 percent over the volume used in 1948. The industry uses liquefied petroleum gas in the smaller communities to make the complete send-out of gas; in the larger communities to augment manufactured or natural gas during peak load conditions or to entirely replace manufactured or natural gas during emergency periods.

There are approximately 400 gas manufacturers using LP gas as their sole source of supply. In cities where liquefied gas is used to augment supplies, the gas companies have installed large storage facilities.

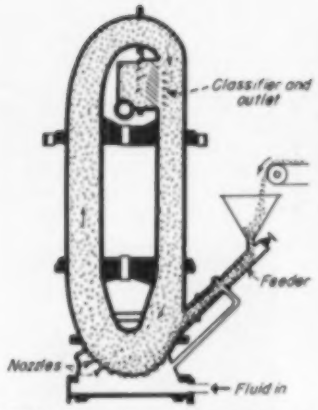
Interest in safety continued at a high level during the year. The ICC has issued new specifications governing transportation of liquefied petroleum gas in cargo trucks (truck tanks) and portable tank containers (skid tanks). The National Fire Protection Association issued a new set of standards for the design, installation and construction of containers and pertinent equipment for the storage and handling of LP gas at gas plants. Also issued were revised standards for design, installation and construction of containers and equipment for handling LP gases.

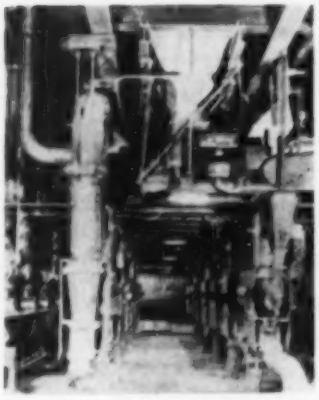
The industry is one of the major fuel suppliers of the country. Reserves and available volumes of LP gas indicate adequate quantities for the increasing future demands.

K. W. RUGH is manager, *Philgas Div., sales department, and* E. O. MATTOCKS *is technical representative, chemical engineering department with Phillips Petroleum Co., Bartlesville, Okla.*

Process Equipment News

THEODORE R. OLIVE, Senior Associate Editor





Fluid energy mill uses compressed air or superheated steam entering through nozzles to carry particles to be ground at high velocity around a "race track." Impact and attrition, largely of particle on particle, reduce product to the low micron range.

Steam or Compressed Air Used to Drive Fluid Energy Mill for Micron-Size Grinding

Mill of "race-track" type, without moving parts, grinds from 4 mesh or finer to low micron range

Considerably lower power requirements than those encountered with mechanical mills are claimed for the grinding of products to smaller than 40 microns through the use of the new Fluid Energy mill of C. H. Wheeler Mfg. Co. As the diagram on the left above shows, the mill is in loop form, with a grinding chamber at the bottom, above a number of nozzles through which the motivating fluid is introduced to impart a high velocity to the solids conveyed around the loop. The feed is introduced at the right of the grinding chamber through a hopper fed by a suitable mechanical feeder. The solids, minus 4 mesh or smaller, are injected into the mill by a venturi nozzle and are there entrained by the motive fluid and conveyed around the closed circuit grinding loop.

Classifying action at the turns throws larger particles to the outside. Part of the motive fluid is withdrawn, balancing the intake, through a number of reverse vanes below and to the right of the upper bend. With the fluid go the finer particles which have been reduced to small enough size. Although some of the grinding takes place by impact and attrition against the walls of the "race track," it is believed that most of it comes from impact and attrition between particles, which are thus reduced to smooth fragments, similar to the pebbles in a stream.

A common nozzle pressure is 50 to 125 psig. for air, or 75 to 200 psig. for superheated steam, which means a nozzle velocity of 1,000 to 3,000 fps. and a velocity of the circulating load of 200 to 400 fps. At 100 psig. the air consumption runs around 500 cfm., requiring about 100 hp. Using steam, the consumption runs around 1,750 to 2,250 lb. per hr. Depending on the character and degree of reduction of the product, output will be from 300 to 2,000 lb. per hr.

The mill can accomplish some drying while it grinds and in some cases can grind and coat. Through variations in nozzle velocity, feed rate and setting of the classifier blades, it can control particle size closely. It is suggested for many types of product, ranging from pigments, through face powders, to abrasives and insecticides. The righthand view, for example, shows a large installation for grinding magnesium silicate talc. Each mill grinds 500 to 750 lb. per hr., averaging 1.4 to 2.0 microns in size, using 500 cfm. of free air at 120 psig. pressure.

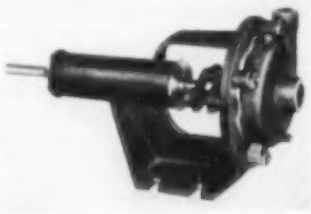
C. H. Wheeler Mfg. Co., Sedgley Ave. at 19th, Philadelphia 32, Pa.

SPEEDS OPERATION:

Twin-Shell Blender

Extremely fast blending time for dry solids, about 4 min. per charge, is claimed for a new twin-shell blender recently developed and patented by Patterson-Kelley. The blender consists of two cylindrical shells intersecting at an acute angle, supported on a horizontal axis. When the two shells are charged to about 60 percent of capacity, the best blend is obtained, the mixing action consisting of rolling, folding, combining and dividing of the material. Charging through an easily operated butterfly valve requires minimum headroom. The interior is smooth, without baffles or obstructions, making for rapid and complete discharge. Construction is dust tight and the design simple. Standard models are available in six sizes ranging from 10 to 75 cu.ft. capacity.

The Patterson-Kelley Co., East Stroudsburg, Pa.



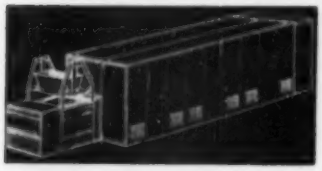
CORROSION RESISTANT:

Illium Pump

Capacities up to 30 gpm. at 35 ft. head, with greater capacities at lesser heads, can be handled at 3,500 rpm. by a new Burgess-Parr centrifugal pump made of Illium corrosion resisting alloy. This small utility pump is

suitable for pilot plant and small industrial applications. It is equipped with heavy duty roller bearings, an oversized shaft, and a non-clog impeller. At slight extra cost, Teflon or other special packings, or Illium mechanical seals, can be provided.

Burgess-Parr Co., Freeport, Ill.



SMALLER CAPACITY:

Conveyor Dryer

To permit continuous drying to be applied to many low-production, high-value products, Proctor & Schwartz has developed a narrow conveyor dryer which is identical in principle to the larger conveyor drying systems previously available, but has been cut down in width to 2 ft. for the conveyor. The manufacturer believes that the new equipment will outmode batch drying in many instances, since it gives all the advantages of continuous drying with products of small output. The machine is also suitable for pilot plant use. Any one of the several Proctor preforming feeding devices used on larger dryers can be employed.

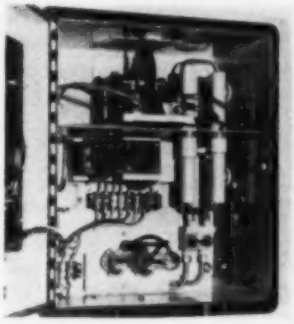
Proctor & Schwartz, Inc., 7th St. and Tabor Rd., Philadelphia 20, Pa.

WET OR DRY:

Vibrating Screen Separator

A compound gyratory motion which vibrates every point of the screen surface simultaneously in a horizontal plane is employed in a new screen separator introduced after three years of development work by Southwestern Engineering. This unusual screen employs circular decks and may have from one to four of them, for up to four separations. The screen is said to be suitable for wet or dry, fine or coarse, heavy or light materials. On each deck the material is tumbled in a spiral path from a central feed to a peripheral discharge which may be located at any point on the circumference. The screen cloth is spring tensioned in such a way as to vibrate without whip. The gyrating unit is provided with a free-floating support so that no vibration is transmitted to the supporting base and the screen may thus be placed on any firm footing, without special foundations.

Southwestern Engineering Co., 4800 Santa Fe Ave., Los Angeles 11, Calif.



CONTROLS QUALITY:

Atmosphere Indicator

In industries such as ceramics, glass and metal treating where controlled atmospheres are used, the quality of product commonly depends on the degree to which such atmospheres are oxidizing or reducing. A new instrument which responds to the character of atmosphere and shows how oxidizing or reducing it may be has been developed by Engelhard. For this purpose, the method is said to be more satisfactory than either the thermal conductivity principle or methods depending on measuring the percentage of combustibles in the gas.

The heart of the detecting unit consists of two special vacuum jacketed sensing cells, known as Viscotron tubes, which tend to recognize physical properties of the gases, such as viscosity and specific heat of the various gases present, contributing to the meter deflection with additive magnitudes of either positive or negative character, depending on whether the gases are characteristically oxidizing or reducing. The cells are essentially vacuum jacketed resistance thermometers built over a glass tube and installed in two arms of a wheatstone bridge circuit.

The gas to be measured passes through one tube, while air for reference purposes is drawn through the other. Current flow through the resistance elements produces heat which is then absorbed to a greater or lesser degree by the gas flowing through the tube. Thus the electrical signal pro-

(*Continued*)

This Month . . .

In February we are feeling decidedly statistical. Have you ever stopped to consider how many new equipment items this department brings you in the course of a year? In our present statistical mood we have just counted up. In 1949 these pages printed exactly 370 items. However, the trend seems to be up —trends are important in February —and in the last several months our new equipment space has been running about 40 percent ahead of the earlier part of 1949. So, 1950 looks like a big year: more politics, more automobiles, more new equipment, more everything. But what of the ubiquitous present? On p. 144 you'll find a new L & N gadget for recording atmospheric sulphur dioxide down to fractional ppm . . . That raw material dumper on p. 146 looks mighty handy for batch processes . . . For space saving the combination crusher-elevator-sizer-bagger shown on p. 154 is worth looking into . . . And if you handle solids flow in spouts, you will be interested in the solids flow detector explained on p. 152.

Next Month . . .

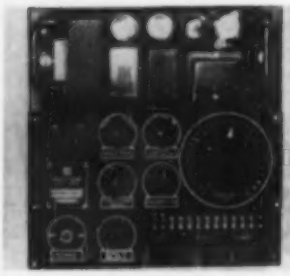
Here are a few of the things to look for here next month. A bagging scale that does everything but talk . . . A "grasshopper" conveyor which really eliminates floor vibration . . . a "hot" idea in evaporators . . . and the newest wrinkle in dust filters.

Cost Index . . .

This month only, look for the Marshall and Stevens Indexes of Comparative Equipment Costs on p. 123, where you will find our annual summary of this series, carried back to 1913. For comparison, on the same page, look for the plot of the M & S index plus the EN-R Construction Cost and Austin Building Cost indexes.

duced depends upon the characteristics of the test gas in comparison with air. This signal is indicated on an arbitrarily calibrated indicator or recorder but can be interpreted by determining empirically which reading gives the desired operating results. The instrument can be used either on atmospheres produced by direct firing or on prepared atmospheres made in exothermal or endothermal generators. Particularly in the latter case, it permits operating in atmospheres which are just sufficiently reducing, and avoids excessively rich mixtures and unduly high operating costs.

Charles Engelhard, Inc., 850 Passaic Ave., East Newark, N. J.



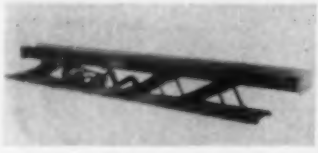
SENSITIVE, LOW-COST:

Electronic Controller

Through its Brown Instruments Division, Minneapolis-Honeywell is marketing a new low-cost electronic temperature controller for industrial applications, said to be sensitive to temperature changes as small as 0.1 degree. Utilizing a resistance thermometer as the sensitive element, the instrument can be employed in the temperature range between −20 and +300 deg. F. Designated as Model No. 077, the controller is said to be immune to vibration, dust and dampness. It can be combined with indicating or recording instruments if a record is necessary. The instrument operates by having the resistance thermometer connected into one leg of a wheatstone bridge circuit, with any electrical unbalance caused by temperature changes amplified electronically to operate either of two output relays according to the direction of temperature change. The two relays in turn control a motor.

This same company, at the recent Chemical Exposition, showed a further development of the idea, now popular with many chemical plants, of diagramming the plant flowsheet on the instrument panel. In the panel in question, the flow diagram represented the towers and vessels symbolically and showed them connected by illuminated, colored piping. At certain points actual instruments were worked into the diagram. The scheme should make diagrams of this sort more graphic, thus aiding operation and also simplifying operator training.

Brown Instruments Div., Wayne and Roberts Aves., Philadelphia, Pa.



USES NATURAL FREQUENCY:

Vibrating Conveyor

Advantages inherent in the use of the natural vibrating frequency of the vibrated structure are said to be obtained in a new design of vibrating conveyor developed by Stephens-Adamson. The conveyor is of the mechanically vibrated type, with the conveyor trough supported on simple coil springs. This construction is said to avoid the high stresses encountered in leaf spring construction. The conveyor can handle a wide range of materials at speeds up to 100 ft. per min. Simple construction reduces moving parts and hence friction losses and maintenance costs. The conveyor requires only 14½ in. head room and can be fabricated in many shapes, open or closed, with a screen deck for scalping, or other variations to meet special conditions.

Stephens-Adamson Mfg. Co., Aurora, Ill.

CHECKS ITSELF:

Automatic SO_2 Analyzer

Known as the Thomas Autometer, a new automatic analyzer for gases

(*Continued*)

PACKAGED SPEED CHANGER

In the plant of Chardon Rubber Co., Chardon, Ohio, are these two new G.E. Speed Variators for providing variable voltage for variable-speed d.c. drives. They are placed alongside of a number of open units for the same purpose. Each of the two small cabinets contains an a.c. motor, driven from the line, coupled to a d.c. generator and exciter. The cabinets also contain all necessary controls, comparable to the controls for the open units shown on the panel board. Variable-speed d.c. motors are placed remotely at the driven machines. These "package" units are small and compact and need no special foundation.–General Electric Co., Schenectady 5, N. Y.

NOW . . .

Larger Pfaudler acid-resisting glass-lined chemical storage tanks

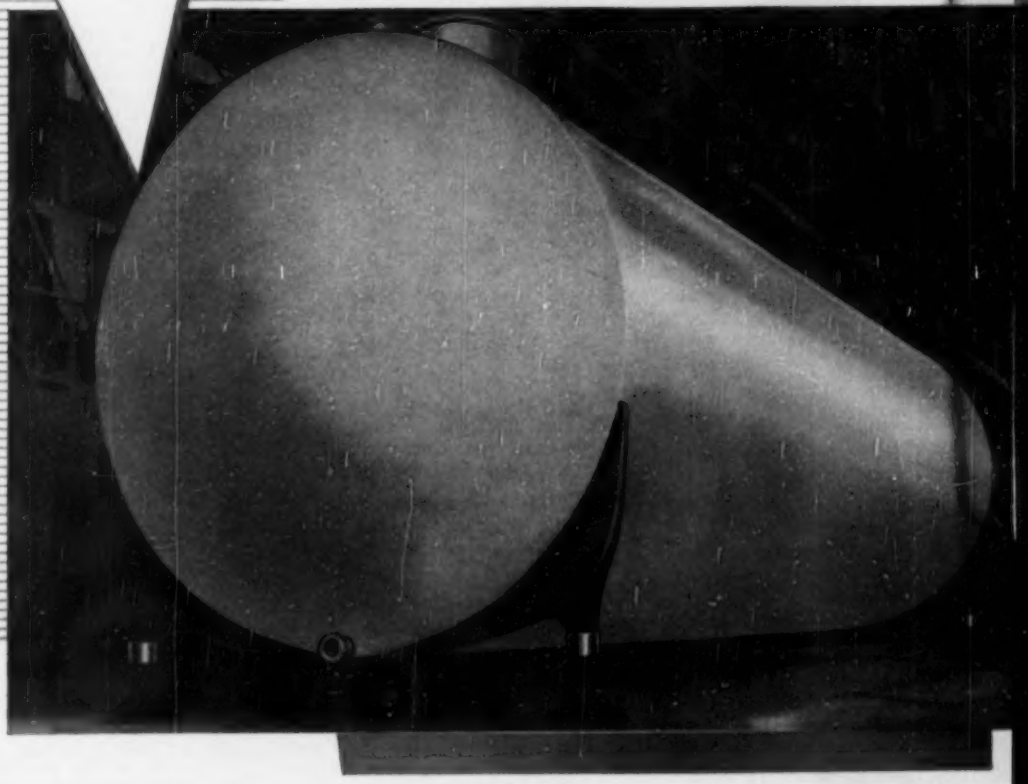
Highly acid-resisting Pfaudler glass-lined steel chemical storage tanks are now available in substantially larger unit sizes than ever before, due to improved methods of manufacture. The result is a marked saving in cost per gallon of storage facilities.

Storage tanks for *all acids, inorganic or organic* (excepting HF), *above 125 deg. F.* are now available in one-piece construction, electrically tested, up to 5500 gallons.

Storage tanks for *all inorganic or organic acids* (*except HF*) *at 125 deg. F. or below* are available up to 13,000 gallons, electrically tested.

As in the past, the exact voltage at which large storage tanks are electrically tested will be adjusted to the severity of the acid conditions.

Storage tanks for neutral and most anhydrous solutions, such as glacial acetic acid, alcohol, formaldehyde and numerous other solvents, are available up to 35,000 gallons. These are not electrically tested. Your inquiries will receive prompt attention. Let us quote on your requirements.



Pfaudler

THE PFAUDLER CO., Rochester 3, N. Y. Branch Offices: 330 West 42nd St., New York 18, N. Y.; 111 W. Washington St., Chicago 2, Ill.; 1328 Howard St., San Francisco 3, Calif.; 818 Olive St., St. Louis 1, Mo.; 13231 W. McNichols Rd., Detroit 21, Mich.; 1316 1st Nat'l Bank Bldg., Cincinnati 2, O.; 1041 Commercial Trust Bldg., Philadelphia 2, Pa.; 761 Little Bldg., Boston 16, Mass.; 334 Chattanooga Bank Bldg., Chattanooga, Tenn.; P. O. Box 4066, Dallas, Texas; Enamelled Metal Products Corp., Ltd., Artillery House, Artillery r.w, London, S. W. 1, England.

THE PFAUDLER CO., ROCHESTER 3, NEW YORK

ENGINEERS AND FABRICATORS OF CORROSION RESISTANT PROCESS EQUIPMENT

Glass-Lined Steel . . . Stainless Steels . . . Nickel . . . Inconel . . . Monel Metal

CENTRIFUGALS

In the Roberts Fluid Drive Centrifugal and only in the Roberts machine are the following features to be had:

★

Standard motor with current peak less than 40% of direct-connected (special) motor drives.

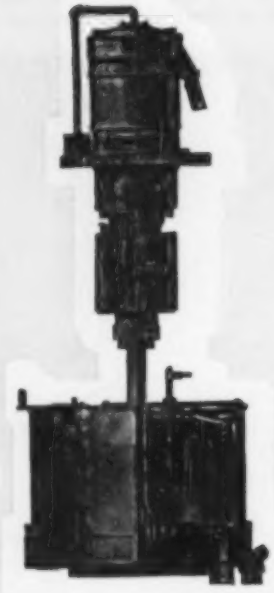
★

Uniform torque, with *adjustable* application.

★

***Simple* adjustment for *accurate* speed control.**

★



The inherent design of our Fluid Drive machine allows special characteristics to be incorporated with ease, thus suiting it exactly to special applications. Let us show you how it can be made to work for your benefit. Send us your inquiry now . . . it imposes no obligation.

ROBERTS
The WESTERN STATES MACHINE COMPANY
HAMILTON, OHIO, U. S. A.

containing sulphur dioxide is being produced by L & N. This meter is a development of Dr. M. D. Thomas of American Smelting & Refining Co. Now available commercially, it enables industrial plants to be warned against atmospheric pollution by SO_2. It continuously records the SO_2 concentration in parts per million, records the average concentration integrated over a half-hour period, automatically checks its own zero reading every 30 min., and marks off each cubic foot of air sampled. Its range of zero to 5 ppm. SO_2 covers the concentration range of interest in pollution surveys. Changes in concentration as small as a few tenths of 1 ppm. can easily be detected. The instrument passes a continuous air sample through a solution which absorbs SO_2, the concentration being indicated by change in electrical conductivity of the solution.

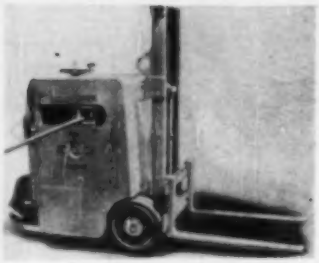
Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa.

OPERATES HYDRAULICALLY:

Raw Material Dumper

Loads of raw materials up to 500 lb. in weight, either solid or liquid, can easily be elevated and dumped into high level kettles or tanks through use of the new Lee Handler made by Lee Metal Products. No power other than water from the plant water main is required for operating the device which readily lifts bags, barrels or drums and tips them so that the material flows out. The trough, shown in the accompanying view, is of stainless steel for corrosion resistance and ready cleaning. If desired, it can be fitted with a hopper enabling dry or liquid products to be dumped and mixed in the trough before elevating. Since the handler is equipped with 6-in. rubber-tired casters, it can be used to serve a battery of tanks or kettles.

Lee Metal Products Co., Philipsburg, Pa.

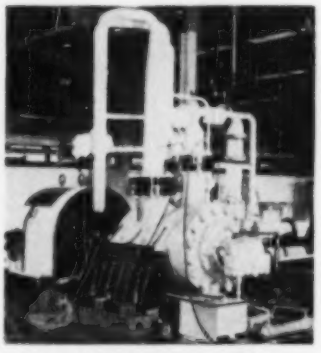


FOR HAZARDOUS LOCATIONS:

Air-operated Truck

A new Crescent "Aisle-Saver" fork truck operating through a hose on any air supply system at 90 psi. pressure has been developed for use in small or restricted areas where explosion hazards exist. The truck consumes only 200 to 250 cu. ft. of air per minute. It is provided with 75 ft. of ¾-in. hose on a retracting reel to permit full maneuverability in about 18,000 sq. ft. of floor area. It is available in 2,000-lb. and 3,000-lb. capacities, with variations in lift, overall height, fork length, etc., to meet various service requirements. An incidental advantage is that the air exhausted from the air motor improves ventilation in the hazardous area, thus providing an extra safety factor.

The Crescent Truck Co., Lebanon, Pa.



HIGH PRESSURE COMBINATION

Set up for test is a new BJ re-entry type boiler feed pump which combines a primary and secondary centrifugal pump in one unit. The arrangement reduces installation space 30 to 50 percent and shows considerable first-cost savings compared with conventional arrangements. Discharge pressure is 1,570 psi. and capacity is 1,980 gpm. The pump is driven by a 2,025-hp. steam turbine at 5,000 rpm. In its primary section water is pumped at 255 deg. F. and in the secondary, at 465 deg. F. The pump is packless.—Byron Jackson Co., Los Angeles 54, Calif.

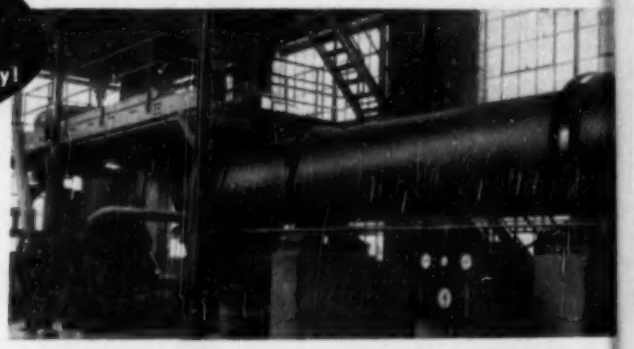
(Continued)

Now Available for

CREATIVE DRYING ENGINEERING

New Louisville Chemicals Dryer costs less, does 50% more work . . . at 77% less operating expense

KNOW THE RESULTS Before You Buy!



FORMER DRYER

Installed cost	$40,000
Annual production (tons)	6,000
Drying cost per ton	3.72

(space required, 1500 sq. ft.)

LOUISVILLE DRYER

Installed cost	$20,000
Annual production (tons)	9,000
Drying cost per ton	0.83

(space required, 500 sq. ft.)

YEARLY SAVINGS of LOUISVILLE DRYER in OPERATING COSTS ALONE $14,850

Other General American Equipment:
Turbo-Mixers, Evaporators, Thickeners, Dewaterers, Towers, Tanks, Bins, Filters, Kilns, Pressure Vessels

A magician's creation? No! The Louisville Dryer described here was installed by a chemical processor after his production was completely analyzed by a Louisville engineer. By using advanced, complete knowledge of drying processes, this dryer was especially designed to fit into his production line after the dryer's performance was pre-determined in our own unique research laboratories and pilot plant.

Without obligation ask a Louisville engineer to survey your drying methods. He may come up with a better solution that costs you less for faster, more satisfactory production.

Louisville Drying Machinery Unit
Over 50 years of creative drying engineering
GENERAL AMERICAN TRANSPORTATION CORPORATION
Dryer Sales Office: Hoffman Bldg., 139 So. Fourth Street Louisville 2, Kentucky
General Offices: 135 South La Salle Street, Chicago 90, Illinois
Offices in all principal cities

Filter Facts

IN THE INTEREST OF BETTER PROCESSING

That's An Idea!

In England plate and frame filter presses are finding favor over vacuum filters for filtering sewage sludge. The reason is dry, easily handled and disposable filter cake obtained, with 40% moisture or less, compared with 70 to 80% moisture in cake from vacuum filters.

Preliminary treatment of the sludge with steam results in a fast settling slurry with altered gel structure and reduced affinity for water on the part of the solids. Most of the water is decanted from the settled material, leaving a thick slurry for filter pressing.

●

In filtering hot slurries it is not always necessary to use a jacketed filter press. Desired filtration temperature for effective flow rates can be maintained in vented three-eyed, as well as double-feed, double-discharge four-eyed filter presses. The vent outlet or one of the feed channels is used to circulate hot solution between the filter and the heated supply tank, thus keeping the press and the solution at the desired temperature.

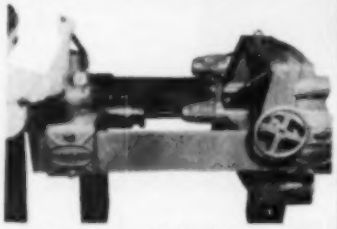
●

A novel investigation was recently completed in the Shriver Lab to control polymerization of a synthetic resin. This plastic requires a heat input to start the reaction, but once under way, the exothermic reaction must be carefully controlled to avoid formation of bubbles.

Using a jacketed filter press, similar in design to a Shriver Wax Cooler, the monomer was charged into the frames exposed to the heating or cooling action of the jacketed plates. At the start of the process, hot water was used to raise the temperature of the monomer to the reaction point. Here the hot water was cut off and circulation of cold water started.

The large area of the mix exposed to the cooling surfaces of the plates provided a rapid transfer of the heat generated by the exothermic phase of the reaction. The result was the production of clear, bubble-free plastic in the form of square cakes, 1" thick.

Say Good-by to the Tommy Bar

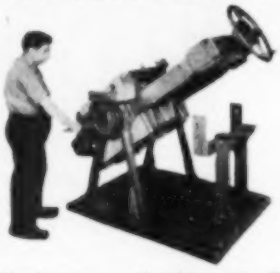


By installing a Shriver Hydro-Kloser on any Shriver 24", 30" or 36" filter press, manual closing is eliminated and faster, safer, tighter closure is assured. Hundreds of these units in use prove their value through savings in closing time and reduction in lost-time accidents, and in improved labor relations.

The Hydro-Kloser assembly is easily installed at moderate cost. A few strokes on the hydraulic pump mounted on the screw standard closes the press at proper pressure. Opening the press takes but a few seconds.

Bulletin 128 tells the whole story. Ask for a copy.

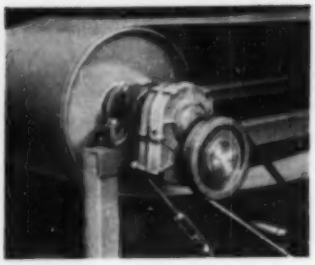
Variations on an Old Theme



Here's one — this tilting type filter press permits filtration with filtering surfaces in a horizontal position, and cleaning with plates and frames in a vertical position. It offers the advantages of horizontal plate filtration where filter aids and cake constituents may form a uniform cake over the filter surface, which is not disturbed by starting or stopping the feed at will.

A worm and worm wheel tilt the press by turning the crank handle. This operating principle can be applied to any size filter press.

T. SHRIVER & COMPANY, Inc., 802 Hamilton St., Harrison, N. J.

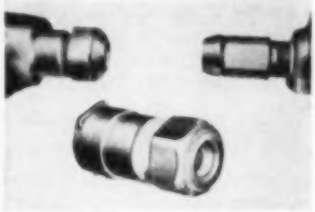


SIMPLIFIED INSTALLATION:

Torque-Arm Reducer

Dodge is now manufacturing a new simplified speed reducer for such applications as conveyors, bucket elevators, agitators, mixers and feeders, which mounts directly on the driven shaft, and makes possible important savings in installation cost. The unit consists of a reducer with a fixed ratio of 15 to 1, driven by a motor through a flat or V-belt drive. The reducer contains a double train of helical steel gears and is locked to the driven shaft by steel collars. A torque arm anchors the reducer and at the same time provides for belt tension adjustment. Where reversal of the load is to be prevented, a back-stop is available which is installed on the input shaft within the reducer housing. To obtain different output speeds with this reducer, it is only necessary to change one of the sheaves to the drive.

Dodge Mfg. Corp., Mishawaka, Ind.



NO LUBRICATION:

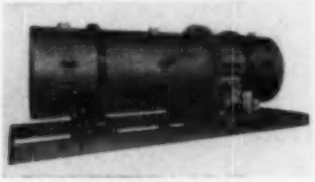
Revolving Joint

A revolving joint which has no bearings, requires no lubrication and presents low turning torque, is being offered by the Rotherm Engineering Co. It is designed to take care of roll misalignment and to be quickly and easily replaceable in event of damage. Should damage occur, the cartridge portion shown in the center of the accompanying view can readily be slipped out and a new one slipped into place.

The joint consists of two ball portions, one secured to the rotating part, and the other to the stationary piping.

The two seat portions are contained within the cartridge which includes a packed, spring-loaded arrangement tending to force the seats apart. The cartridge element does not rotate. The joint is designed to permit a siphon pipe to be used. Design is such that the higher the pressure, the tighter the seal. The seal is said to be good for temperatures from −40 to +500 deg. F., for steam, air, oil, gas, water and a variety of other fluids.

Rowthern Engineering Co., 4911 West Irving Park Rd., Chicago 41, Ill.

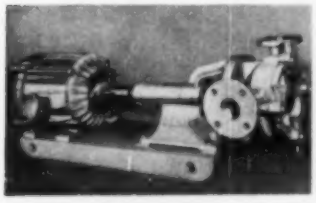


PRODUCES PELLETS:

Granulation Process

Many advantages over present methods for preparing fertilizer are claimed for the new granular or pelletized fertilizer process now being offered by Sturtevant. The process employs a rotary granulator, similar in appearance to a rotary dryer. The equipment is rugged in construction and is said to require little, if any, maintenance. It produces fertilizer granules of uniform size which are said to be capable of storage over long periods without caking. This feature should, it is claimed, enable manufacturers to prepare fertilizer well in advance of anticipated market demands, and thus even the production load. Furthermore, it is stated, granular fertilizer holds its chemical properties without deterioration because of the hard granular form. Advantages in application are also claimed.

The Sturtevant Mill Co., 100 Park St., Boston 22, Mass.



EASY CLEANING:

Latex Pump

Specially designed to handle creamed or centrifuged latex, but suitable also for other liquids of similar characteristics, a new centrifugal pump with 2 in.

(Continued)

Looking for a way to cut maintenance costs HERE?

. . . Use Transite Industrial Vent Pipe

IF REPLACEMENT of venting equipment is running up your plant maintenance costs, Transite* Industrial Vent Pipe may help you save money.

In numerous installations, this Johns-Manville asbestos-cement product has demonstrated its ability to give long-term, economical service. Rustproof, it successfully resists many of the corrosive fumes, dusts, vapors and gases encountered in industrial venting operations. It requires no painting or other protective treatment—can be used for vents, ducts or stacks, in either indoor or outdoor service.

Transite Industrial Vent Pipe is available in a wide range of sizes (up to 36″ diameter) with a complete line of Transite fittings that adapt it to practically any job requirement. It is light in weight and readily handled—can be cut and drilled on the job with ordinary tools. For additional information, write for Data Sheet, Series DS-336. Address Johns-Manville, Box 290, New York, N. Y.

JM

**Transite is a Johns-Manville registered trade mark.*

Typical industries in which Transite Industrial Vent Pipe is used:

Aircraft	Dairy	Gas	Paint	Shipbuilding
Automobile	Drug	Glass	Petroleum	Shoe
Baking	Electrical	Laboratory	Potash	Smelting
Bleaching	Explosives	Laundry	Pulp & Paper	Soap
Boiler Works	Farm Machinery	Leather	Quarrying	Soft Drink
Brewing	Food	Match	Railroad	Sugar Refining
Canning	Foundry	Meat Packing	Rayon	Textile
Ceramic	Furnace	Metal	Refrigeration	Tool
Chemical	Furniture	Mining	Rubber	Water & Sewage

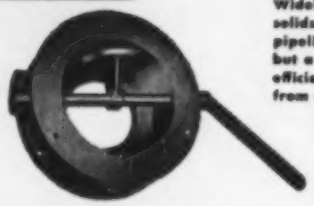
Johns-Manville TRANSITE Industrial Vent PIPE

GEMCO
SPHERICAL
DUST-TITE
VALVES

....NEVER STICKS!

SAVES LABOR . . . TIME . . . MATERIALS

No Spillage! No Dusting! Absolutely Tight!



Type "T" Shown Open
Openings 2" to 16"

Widely used for controlling the flow of solids from bins, hoppers, blenders and pipelines. GEMCO opens and shuts with but a 90° handle swing, gives maximum efficiency. Safeguards employees' health from dust.

PRECISION BUILT FOR YOUR JOB!

GEMCO is the answer . . . foolproof, built for years of smooth, uniform, trouble-free operation, without the waste and headaches identified with oldstyle slide gate valves. Unqualified guarantee.

Mr. Jack Strong, Newark, N. J., Manager of THE EAGLE-PICHER COMPANY plant, reports . . . "We are using GEMCO VALVES for many of our operations and they are tops . . . We recommend to anyone needing a valve that DOES NOT STICK, FREEZE OR LEAK, TRY GEMCO."

The seat is self cleaning . . . it is scraped by the ground disc as it closes, ever ready for quick, continuous action.

Send for new low prices!

General Machine Company of New Jersey

Established 1916

SPECIAL CHEMICAL AND MIXING MACHINERY • SPHERICAL VALVES

400 MARKET STREET • NEWARK 5, N. J.

We made most of our errors

THE value of long experience in the manufacture of specific chemicals is that most of our failures or errors belong to a distant past. So in all our products we are able to maintain the exacting standards of quality we have established. "Experience is the best teacher" is a great deal more than a school book maxim to us.

OLDBURY

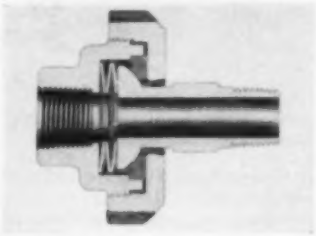
ELECTRO-CHEMICAL COMPANY

Plant and Main Office:
NIAGARA FALLS, NEW YORK

New York Office:
19 RECTOR STREET, NEW YORK 6, N. Y.

discharge and 2½ in. suction has been announced by Deming. The pump is of the centrifugal type, with fully open impeller mounted on a tapered-end shaft for easy removal. Water cooling of the stuffing box prevents coagulation around the shaft. The casing cover is designed to be removed in a matter of seconds for easy cleaning of the pump, without disturbing either suction or discharge piping. Since the suction inlet is at the stuffing-box side of the pump, there is only suction pressure against the packing.

The Deming Co., Salem, Ohio.

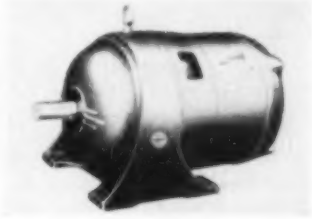


LOW TORQUE:

Rotary Pipe Joint

Elimination of wedge action of the ball against the gasket, with consequent almost complete elimination of turning torque, is claimed for a new rotary swivel pipe joint for swivel and slow revolving applications now offered by Barco. The joint permits a small amount of side flexibility, reducing the possibility of wear or breakage from side strain. It is said to be leakless at extreme temperatures and is made in extra heavy models for extreme pressures and vacuums. It can handle practically all fluids and gases, including acids and alkalis, at continuous rotation up to 30 rpm.

Barco Mfg. Co., 1801 West Winnemac Ave., Chicago 40, Ill.



HIGH PERFORMANCE:

Geared Reduction Motor

Two concerns, Foote Bros. and Louis Allis, have recently announced a joint program for the manufacture

and sale of a complete line of gear motors. Manufactured in 17 sizes, they provide single, double and triple reduction units having output speeds from 780 down to 7.5 rpm. Power ratings range from 1 to 75 hp. and a variety of motor enclosures can be employed, including conventional open drip-proof, splash-proof and totally enclosed and explosion-proof types. Motors may be either a.c. or d.c. and motors with special electrical characteristics can also be provided. These motors employ hard helical gears and other moving parts, specially processed and heat treated by new methods.

Foote Bros. Gear & Machine Corp., 5301 Southwestern Blvd., Chicago, Ill. and Louis Allis Co., Milwaukee 7, Wis.

SIMPLIFIES REPACKING:

Forged Steel Valve

Latest among the developments of Edward Valves is a line of forged steel stop valves in sizes from ¼ to 2 in., built of carbon or chromium molybdenum steel for two ranges of service, namely, 600 psi. at 900 deg. F. and 1,500 psi. at 850 deg. F., for steam, oil and gas service. These all-purpose valves, identified as Fig. 444, feature ease of repacking and reduced pressure loss. Swing bolted packing glands and large packing chambers make repacking simple. Through interchangeability of parts, maintenance inventories are reduced. Valves are produced with both bolted and union bonnets, and with screwed or socket welding ends.

Edward Valves, Inc., East Chicago, Ind.

CONSTANT ANALYSIS:

Inert Gas Generators

Two new inert gas generators of small size, designated as Models 1 MIHE and 2 MIHE, have been added to the Kemp line. The generators are rated respectively at 1,000 and 2,000 cfh. An important feature is their ability to provide the same analysis of

(Continued)

TOP: General view of the protected area.

CENTER: Foam discharge at the rate of 2 in. per min.

BOTTOM: Area covered by 6 in. of foam blanket in 3 min.

it's NEW!

"Automatic" AER-O-FOAM PROTECTION FOR INDUSTRY

For many years fire protection engineers have been faced with the problem of finding a feasible answer to the hazard caused by crowded plant facilities where flammable liquids are involved. Conditions of this type exist in many chemical processing industries, metal working plants, petroleum storage and handling and electric power generation properties. A severe hazard was evident at the Schenectady Varnish Company, Schenectady, N. Y., where fire at the tank car loading racks and storage facilities presented a constant threat to the operation of the entire plant.

Having had a background in the development of all types of automatically operated fire protection equipment, "Automatic" Sprinkler engineers designed and installed the mechanical foam system, test photos shown above, and which is now commercially identified as "Automatic" AER-O-FOAM.

The important engineering advantages of this form of protection are evident in the improvement of drainage conditions, reduction of water supply requirements, non-corrosive action of the foam material, positive fire extinguishment and prevention of reflash. As "Automatic" AER-O-FOAM dehydrates rapidly following application, clean-up operations are held to a minimum.

Pump houses, processing buildings, loading and unloading racks, can and drum filling areas, flammable liquid storage and similar hazards familiar to the chemical processing industry can now be positively protected through the media of "Automatic" AER-O-FOAM. Your nearest "Automatic" Sprinkler representative will be glad to show you how and—at no obligation to you. Write or call today for descriptive literature.

"AUTOMATIC" SPRINKLER CORPORATION OF AMERICA
YOUNGSTOWN 4, OHIO

"Automatic" Sprinkler
FIRST IN FIRE PROTECTION

DEVELOPMENT · ENGINEERING MANUFACTURE · INSTALLATION
OFFICES IN PRINCIPAL CITIES OF NORTH AND SOUTH AMERICA

The installation illustrated has been in operation a year and has established an unusual record of recoveries — IT HAS SAVED MONEY. There are six DRACCO Dust Control Units, capable of handling 162,000 to 180,000 C. F. of air per minute. It is used after a mill drying system where 5 to 6% moisture is removed from the coal at the same time it is being pulverized. 1/2 to 1% of the coal ground is recovered by the DRACCO Dust Control System. The saving is substantial because 180 tons are pulverized per hour. DRACCO Dust Control replaced a wet wash system.

For Further Information Write

DRACCO CORPORATION

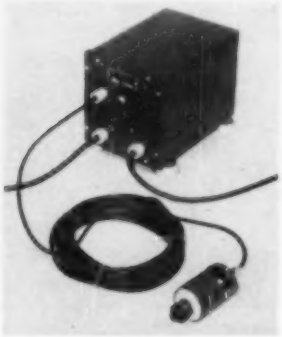
4071 E. 116th St., Cleveland 5, Ohio New York Office: 130 W. 42nd St.

DUST CONTROL EQUIPMENT
PNEUMATIC CONVEYORS • METAL FABRICATION

inert gas regardless of demand, according to the manufacturer. The output analysis is 87-88 percent nitrogen and 13-12 percent carbon dioxide at all outputs between 20 and 100 percent of rated capacity. Water vapor content is equivalent to saturation at the discharge temperature. The gas is claimed to be so pure that it may be used without further processing in the manufacture of aspirin, laboratory chemicals, fire paints, and so on.

These generators operate automatically on fuel gas and air and are adjustable to operate on gas of any type.

C. M. Kemp Mfg. Co., 405 East Oliver St., Baltimore 2, Md.



SHOWS STOPPAGES:

Solids Flow Detector

Signa-Flo is the name of a new electronic detector for signalling the stoppage of solids flowing in chutes or spouts, which has been announced recently by Buffalo Electronics. The device employs a sensing needle mounted in the side or top of the chute or spout. This needle detects the extremely slight pressure resulting from movement of the solids past it. Its voltage output is so small however that it must be amplified electronically. Output of the amplifier, in turn, is fed to a control panel where it operates signal lights and may also operate an audible signal when a stoppage occurs.

In addition to its use in detecting stoppages, the Signa-Flo is also finding application in detecting and signalling when a hopper has been filled to the highest desirable point. This is accomplished by installing the sensing unit within the hopper, beneath the feed chute, at a height slightly below the highest level desired. As long as material is flowing into the hopper the needle detects its pressure. As soon as the level reaches the needle, however, the pressure is equalized on

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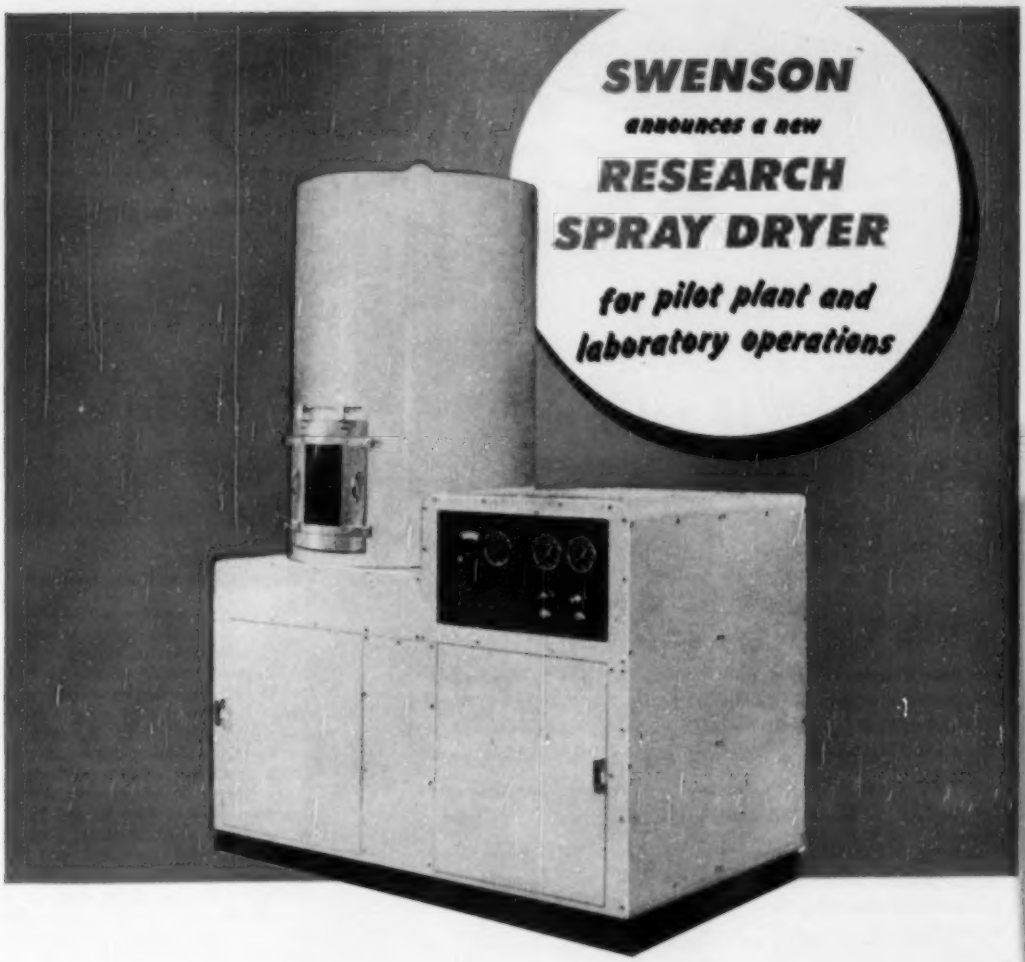


This new unit provides instant drying at low temperatures with close control of the moisture content of the finished product. It is recommended for all applications requiring small drying capacities.

The Swenson Research Spray Dryer can be used as a research tool for the development of new products and new processing methods of old products. It can be used for the commercial production of high-value, low-volume pharmaceutical and fine chemical products where present processing methods result in poor quality control and costly losses. Completely described in Bulletin D-106—send for a copy.

SWENSON EVAPORATOR CO.
DIVISION OF WHITING CORPORATION
15669 Lathrop Avenue Harvey, Illinois
Eastern Sales Office and Export Department: 30 Church Street, New York 7, N. Y.
In Canada: Whiting Corporation (Canada) Ltd., 47-49 LaPlante Ave., Toronto 3

Save time and money on color formulation. Come to Williams where you have a choice of 142 pigments. From these you can quickly and easily pick a pigment having the color, physical and chemical properties you require. Only Williams can offer you such a broad selection.

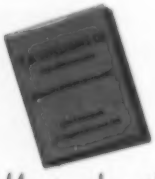
You'll find 108 shades and types of synthetic and natural iron oxides; 64 reds, 24 browns, 18 yellows, 2 blacks.

You'll find metallic browns, venetian reds, ochers, umbers, siennas, lampblack, chromium and cuprous oxides plus a complete line of extender pigments.

So write today, stating your requirements. We'll be glad to send you complete technical information immediately.

Address

C. K. Williams & Co., Department 3, Easton, Pennsylvania



Yours... for the asking!

Complete TECH-REPORTS on Pure Red Iron Oxides, Pure Yellow Iron Oxides, Chromium Oxides, Venetian Reds, Siennas & Umbers, Red and Brown Iron Oxides, Metallic Browns and others. Send today!

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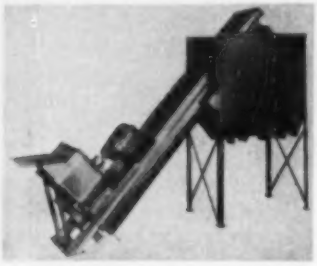
COLORS & PIGMENTS
C. K. WILLIAMS & CO.
EAST ST. LOUIS, ILLINOIS
EASTON, PENNSYLVANIA
EMERYVILLE, CALIFORNIA

all sides and the "full" signal is given.

It is claimed that the Signa-Flo is capable of detecting a stoppage even when the desired flow rate is only a few ounces per hour. It is claimed further that the warning is given even if there is a "choke-up" all around the needle.

Buffalo Electronics Corp., Kenmore 17, N. Y.



DOES FOUR JOBS:

Combination Crusher

Economy in space is an important characteristic of the new Economiser, a combination crusher, conveyor, sizer and bagger currently offered by Gifford-Wood. This device consists of a crusher handling lumps of semifriable materials up to 10x10 in. in size, mounted on a sloping screw conveyor which terminates over a triple hopper. The conveyor discharges over slotted screen openings of ¼ x ¾ in. and 1¼ x 2 in., so as to produce three sizes of crushed material, separated into the three hoppers, at rates up to 200 lb. per min. Precise sizing control is claimed through use of an adjustable comb. A single 1½-hp. motor provides power both to the crusher and to the screw conveyor and there are only two shafts, operating in anti-friction grease-sealed ball bearings. The hopper unit is elevated so that bags can readily be filled below the three discharge points. The entire unit occupies a space of only 2¼ ft. wide, 10¾ ft. long, and 7½ ft. high.

Gifford-Wood Co., Hudson, N. Y.

FOR FIELD USE:

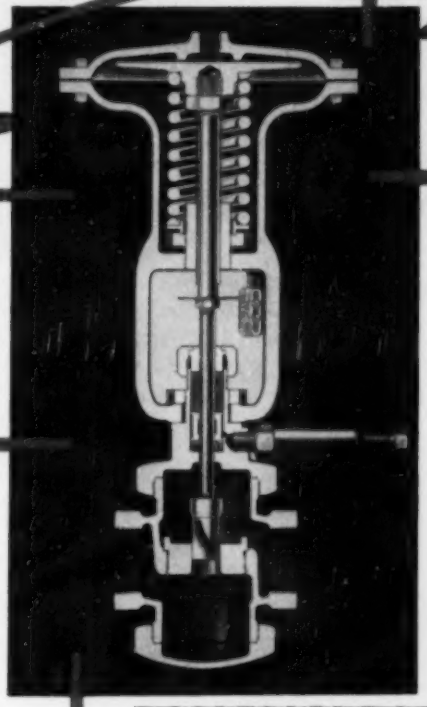
Portable Manometer

Designed primarily for checking the calibration of gas orifice meters in the field, a new manometer weighing only 3¾ lb. is being offered by Meriam. The manometer is provided with a bubble level and a universal ball and socket type clamp for mounting to the meter piping. It is of sturdy construction, made of stainless steel with pre-

(Continued)

FISHER TYPE 510-S

PRESSURE REGULATOR and DIAPHRAGM CONTROL VALVE



MATERIAL

Bronze and stainless steel bodies.

SIZES

½" to 2."

SERVICE

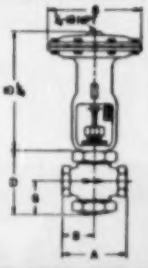
For direct action pressure regulators and reducing valves up to 50 pounds reduced pressure.

For 2 to 15 pounds pneumatic actuation with ¾" valve travel and utilizing popular Micro-Flute Pup inner valve, V-Port, Quick-Opening or Composition Disc inner valve in single seat valves—or available with double ported V-Port or Quick-Opening inner valve construction.

Particularly adapted to service where small size and compactness are desirable.

DIMENSIONS

SIZE	A	B	D	G
½	3⅛	1⁹⁄₁₆	3¹⁵⁄₁₆	1⁹⁄₁₆
¾	3⅛	1⁹⁄₁₆	3¹⁵⁄₁₆	1⁹⁄₁₆
1	4⅛	2⅛	4⅝	2⅛
1¼	4⅛	2⅛	5	2½
1½	4⅛	2¾	5½	2⅞
2	5¼	2⅞	6½	3⅛



FISHER GOVERNOR CO. Marshalltown, Iowa

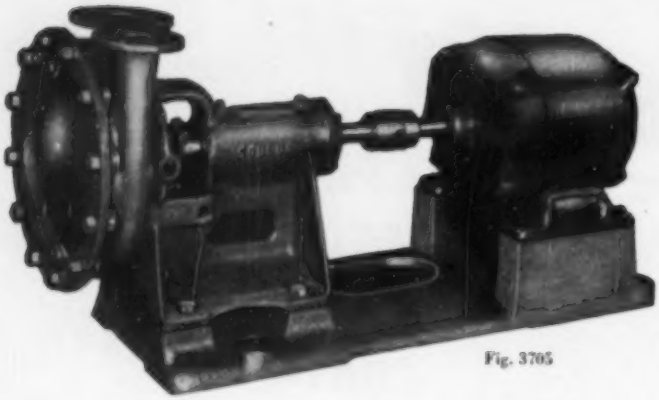


Fig. 3705

For Outstanding Service Handling Corrosive Liquids—

Goulds new stainless steel centrifugals

ADVANCED PUMP DESIGN—

The Goulds 3705 stainless line represents the last word in effective design. Fig. 3705 pumps will give you efficient, dependable, 24-hour service in handling corrosive liquids—at low cost.

CAPACITIES—

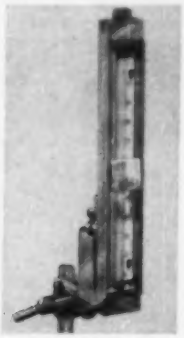
Goulds stainless steel centrifugals are made in 8 sizes with capacities to 750 G.P.M. and heads to 180 ft. depending upon capacity.

ADVANTAGES—

Exceptional efficiency (see Bulletin for performance curves) plus extreme simplicity make this an ideal pump for corrosive applications. High interchangeability of parts cuts stocking problem. Quick inspection or cleaning—simply remove casing cover without disturbing pipe connections.

Write for Bulletin 725.3 for complete details on this new stainless steel pump.

Goulds PUMPS INC.
Seneca Falls
New York



cision bore tubing. A sliding magnifier is provided to permit readings down to 0.2 in. of water. A mirror prevents parallax in reading. Operating on mercury, the instrument is calibrated from 0 to 110 in. of water. It comes complete with the necessary mercury, a length of rubber tubing and a metal carrying case.

The Meriam Instrument Co., 10920 Madison Ave., Cleveland 2, Ohio.

Correction—It has been pointed out that the capacity of the Super-Sorter described on p. 134 of our December 1949 issue might be miscontrued. The capacity of each of the four eight-cell units is 100 tons per hr. on 4 x 0-in. bituminous coal, or 400 tons per hr. for the installation.

Briefs . . .

DUST COLLECTOR. Portability is a feature of a new dust collector rated at 3,630 cfm., offered by Aget-Detroit for removing dust from such operations as grinding and pulverizing, and exhausting the cleaned air outdoors. The unit occupies a floor space of 28x49 in., with 82 in. overall height. It includes a self-cleaning paddle wheel fan direct-connected to a 5 hp.-motor, in combination with a cyclone separator and a 12-cu.ft. dust storage compartment. The inlet diameter is 8 in. *Aget-Detroit Co., Ann Arbor, Mich.*

FILTER-REGULATOR. For instrument and similar applications, Norgren has announced a combined filter and pressure regulator for air or non-corrosive gases at pressures up to 125 psi., and ambient temperatures to 120 deg. F. Air is introduced to the filter through a centrifugal arrangement which throws out moisture and entrained

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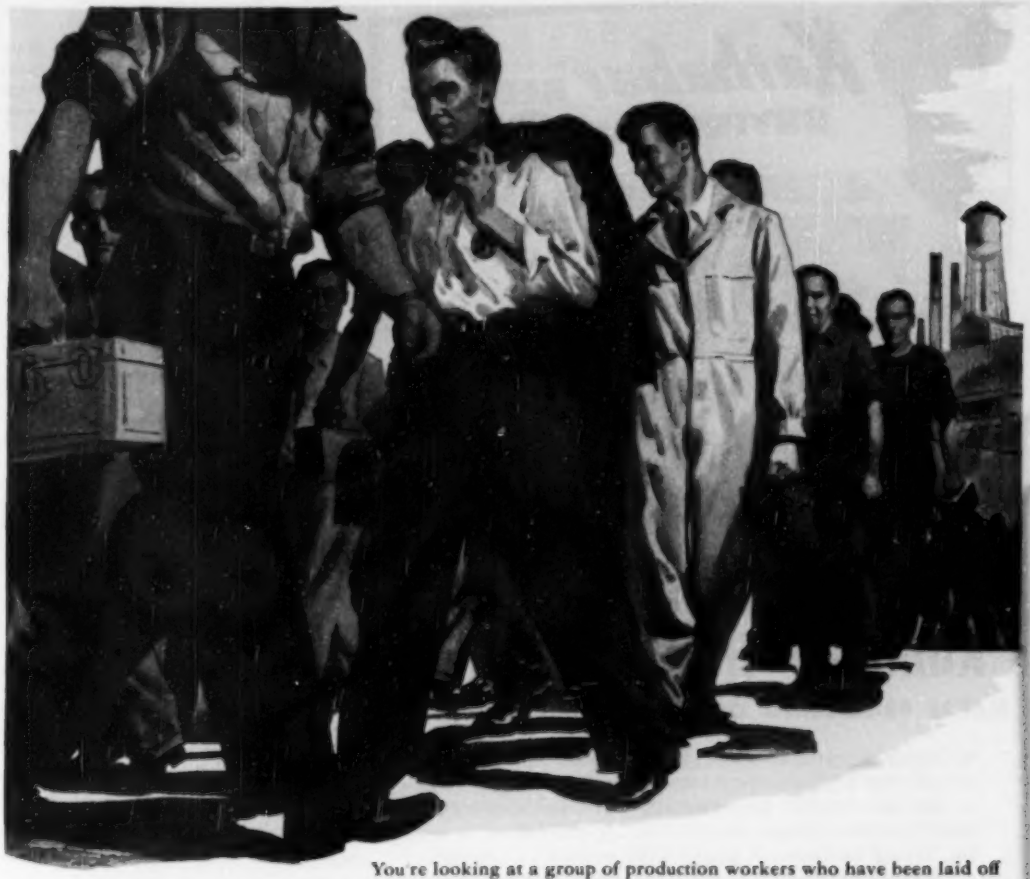

STRIKE?

no..they're out because of a broken bolt!

You're looking at a group of production workers who have been laid off temporarily—because a certain bolt in an all-important drive corroded to failure.

One of the most regrettable aspects of this situation is that it *could* have been avoided... by specifying non-ferrous or stainless steel fastenings at the time the equipment was purchased; or by replacing common steel fastenings *on delivery* with bolts, nuts, screws, rivets and accessories that *resist* corrosion.

Harper specializes in these Everlasting Fastenings; makes them in over 7000 different sizes, types and alloys—Brass, Bronzes, Copper, Monel and Stainless Steels. Large quantities are maintained in stock for immediate delivery to manufacturers everywhere who know by experience the extra qualities you get in Harper fastenings—better appearance, longer life, ease of cleaning and resistance to high temperatures. They're most economical in the long run.

Write today for 134-page catalog and current stock list.
The H. M. Harper Company, 8206 Lehigh Avenue,
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AMERICA'S LEADING SPECIALIST IN NON-FERROUS AND STAINLESS STEEL FASTENINGS

HARPER

EVERLASTING FASTENINGS

ONE OF THE HUNDREDS OF WAYS

Kathabar Humidity Control

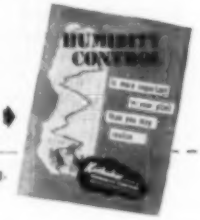
MAKES PROCESSING OPERATIONS MORE PROFITABLE

● Drying of pasted shoe soles was a problem for a leading shoe manufacturer. Conventional drying methods were satisfactory in the low-humidity winter months but unsatisfactory in the high-humidity summer months. Also, it was desired to reduce the drying temperature from 110°F. to 95°F. if possible.

Without any major change in the existing drying equipment a Kathabar System Package Unit was installed. From the beginning of the operation it was successful . . . so much so a second Kathabar installation was started immediately.

Drying time was reduced from eight hours to one hour and product quality improved over the former method.

The Kathabar System is the better way to condition the air wherever humidity is a problem. GET THE FACTS TODAY!



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solids. Filtration then takes place through a 200-mesh Monel screen. The cleaned air then passes through the regulator. *C. A. Norgren Co., 222 Santa Fe Drive, Denver 9, Colo.*

PLASTIC ARMOR. Metal tubing coated with a plastic armor of high corrosion resistance, designed primarily for use as electrical conduit or for piping of non-corrosive materials in corrosive atmospheres, has been introduced under the name of Dekoron tubing. Various thermoplastics, such as polyethylene, or cellulose acetate butyrate, are extruded over metal tubing of either ferrous or non-ferrous analysis. Present applications include electrical conduit in chemical, salt and other plants having corrosive atmospheres. Present sizes range up to 3 in. O.D. with coating thicknesses of 0.01 to 0.062 in. The cost is said to be comparable to rigid conduit. *Samuel Moore & Co., Dekoron Tubing Division, Mantua, Ohio.*

QUALITY CONTROL. A new slide rule, developed by John M. Howell, solves problems of statistics and quality control according to basic principles of quality control adopted by the American Standards Association. In addition to the traditional log log scale arrangements long familiar to engineers, the new rule has specialized quality control scales not heretofore available in slide rules. It permits setting up control limits, comparison of process limits with specification limits and permits finding areas and ordinates of the normal curve. *Pickett & Eckel, Inc., 5 South Wabash Ave., Chicago 3, Ill.*

HOT MATERIAL BELT. Lee Rubber has brought out a new type conveyor belt for handling hot materials, based on a carcass constructed with multiple plies of glass fabric, plus covers specially compounded to resist heat. In one installation involving materials carried at 400 deg. F., the new belt has given 14 months service compared with 10 weeks' service formerly considered good for regular hot material belts. *Republic Rubber Division, Lee Rubber & Tire Corp., Youngstown 1, Ohio.*

RUBBER PAIL. Latest development of Stokes is a molded rubber pail, utilizing a virgin rubber base compound, for handling acid and alkaline chemicals. The pail is said to have greater resistance to corrosive

(Continued)

It looks simple..

. . . it's a precision device. A BS&B SAFETY HEAD is a preformed metal rupture disc held together by two specially designed flanges. When over-pressure threatens, this "weak spot" bursts and saves the vessel. It looks simple . . . but, each part is made with extreme care and precision.

Behind the delivery of SAFETY HEADS to you for the protection of your equipment and employees are 4 big factors:

1 "KNOW-HOW" gained by priceless years of experience in this highly specialized field. 2 A STOCK-PILE . . . an amazingly large stock-pile of many metals with countless sizes and thicknesses—all of controlled specifications and uniformity. 3 SPECIAL EQUIPMENT painstakingly designed and built by BS&B for the one job of building SAFETY HEADS. 4 A LABORATORY . . . completely equipped to test the qualities and properties of metals used in SAFETY HEADS.

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Black, Sivalls & Bryson, Inc., Special Products Division, 720 Delaware, Kansas City 6, Missouri.

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"Sure, I'd wear a respirator . . .

. . . if it was comfortable!"

Respirator Style 450

Respirators must fit properly and provide ease of breathing before workers stop risking their lungs—and your profits.

Protection must be combined with comfort. One without the other means a wasted investment in safety equipment. Here is a WILLSON lightweight respirator, approved by the U. S. Bureau of Mines for use in dusts and mists. It has gained wide acceptance in industry through workers' willingness to wear it. Normal breathing is assured through easily replaceable filters and a positive acting exhaust valve. The facepiece, in two sizes with adjustable wire nose spring and adjustable elastic headband, is adaptable to all face sizes.

NEW CATALOG

In addition to product information, it contains information on safety glass, filter glass, respiratory hazards, etc., which will help you select proper safety equipment to meet specific hazards. Send for it!

WILLSON

"Established 1870"

WILLSON PRODUCTS, INC., 223 WASHINGTON STREET, READING, PENNA.

chemicals, abrasion and heat than conventional compounds. Its bail type handle is made of lead-plated stainless steel with a hard rubber grip, mounted in cast lead bearings molded into the bucket. *Stokes Molded Products, Inc., Taylor St., Trenton 4, N. J.*

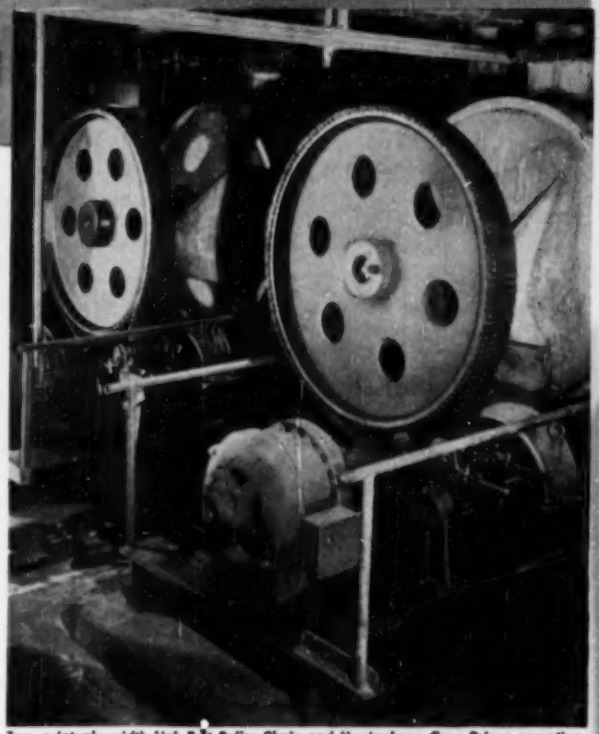
METAL HOSE. For pressures up to 350 psi., in conveying oil, gasoline and other volatile liquids, a new metallic hose said to be especially tough and flexible has been developed by Penflex. The Titepak flanges developed for use with the hose are said to be absolutely leakproof under all conditions. *The Pennsylvania Flexible Metallic Tubing Co., 7203 Powers Lane, Philadelphia 42, Pa.*

NEW EXTINGUISHER. Deviating from its standard 4 and 5 lb. sizes, Randolph is now producing a portable 6 lb. carbon dioxide extinguisher in a compact, lightweight unit featuring a thumb-trigger release and self-aimed nozzle. Only one hand is required to operate the extinguisher. In tests it is claimed to have extinguished a 16 sq. ft. gasoline fire in 7½ sec. *Randolph Laboratories, 8 East Kinzie St., Chicago 11, Ill.*

DIFFUSION PUMP. A speed of approximately 300 liters per second in the range from 10^{-4} to 10^{-6} mm. Hg, said to be the highest ever achieved with a 4 in. I.D. pump casing, is claimed for the new MCF-300 fractionating diffusion pump offered by DPI. The pump attains an ultimate vacuum of 5×10^{-7} mm. Hg at 25 deg C. without cold traps. It employs a three-stage concentric-cylinder type fractionating jet assembly, fitted into an enlarged boiler. With Octoil as the pump fluid it will operate against a forepressure of 0.150 mm. Hg, or more, depending on the heater input. *Distillation Products, Inc., 755 Ridge Road West, Rochester 13, N. Y.*

MONEL SNUBBER. Pressure snubbers formerly made in stainless steel and brass by the Micro Metallic Corp. are now available in Monel also through the agents, Chemiquip Co. This development extends snubber protection to pressure gages subjected to liquids or gases for which Monel is most resistant. These snubbers may also be used as filters for small flows, such as instrument air. They are available for ¼ and ⅜ in. lines. *The Chemiquip Co., 193 Bradford St., Brooklyn 7, N. Y.* —*End*

LINK-BELT *Precision Steel* ROLLER CHAIN *GIVES* POSITIVE POWER TRANSMISSION PLUS LONG LIFE



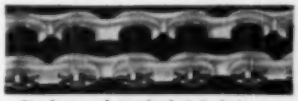
Two quintuple width Link-Belt Roller Chain and Herringbone Gear Drives operating tankage dryers. These drives eliminated noisy, troublesome arrangements of bulky gears and spur pinions.

Performance on every type of equipment and in every industry proves the high quality of Link-Belt Precision Steel Roller Chain, incorporating the knowledge and experience of the world's largest manufacturer of chain.

Positive transmission of power, efficient conveying, compactness, wide flexibility of arrangement, ability to absorb shock, are characteristics of roller chain which are enhanced by the precision manufacturing methods and metallurgical control followed in the huge Link-Belt chain plant.

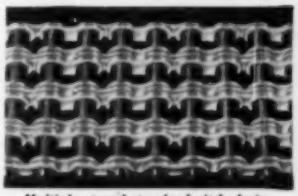
Link-Belt Precision Steel Roller Chain runs slack on long or short centers, minimizing shaft bearing pressure, and operates at highest efficiency, since there is no possibility of slip. A number of shafts, turning in either direction, can be grouped in a single drive. The flexibility of each joint supplies a general cushioning effect, absorbing rather than transmitting shock from one shaft to another.

Link-Belt Precision Steel Roller Chain and sprockets are available immediately, in single or multiple widths, in ⅜" to 2½" pitch. Also with various types of attachments as well as the Universal Carrier, Flat-top, double pitch and horizontal plane bend types of chain. Made to manufacturers' (A.S.A.) standards. Send for Data Book No. 1957-A.

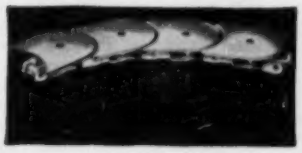


Single strand standard pitch chain.

Double pitch roller conveyor chain.



Multiple strand standard pitch chain.



Universal Carrier chain, flexes in 2 planes.

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Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices, Factory Branch Stores and Distributors in Principal Cities. 11,250-C

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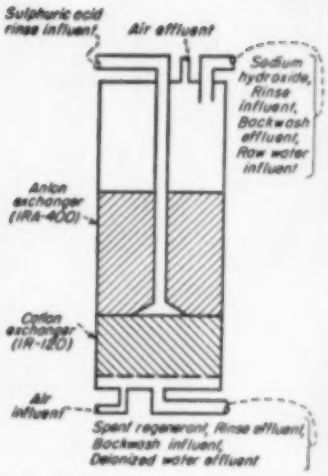
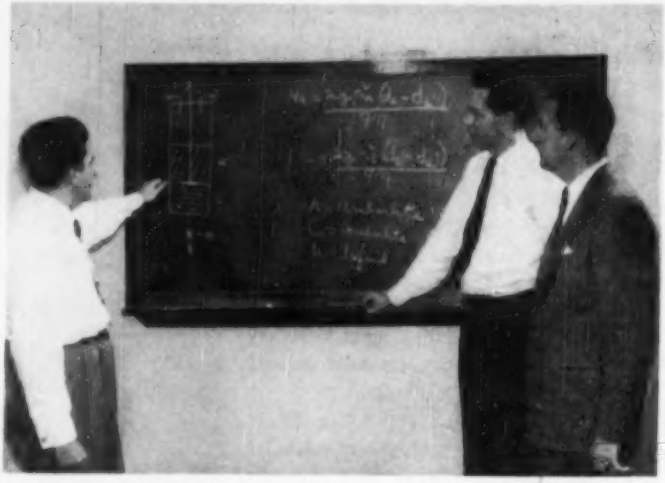
New Products and Materials

JOSEPH A. O'CONNOR, News Editor


Sulphuric acid rinse influent
Air effluent
Sodium hydroxide, Rinse influent, Backwash effluent, Raw water influent
Anion exchanger (IRA-400)
Cation exchanger (IR-120)
Air influent
Spent regenerant, Rinse effluent, Backwash influent, Deionized water effluent

Cation & anion exchangers share bed.



Rohm & Haas researchers thrash out their concept of mixed-bed deionization.

Two in One: Both Resins in Single Bed

Water of extraordinary purity—containing less than one part of ionic solids per 100 million parts of water—can now be produced by simple passage through a mixed bed of Amberlite ion exchange resins, the Resinous Products Division of Rohm & Haas Co. reports. The new technique permits complete removal of inorganic salts without deviation from pH 7.0, the point of chemical neutrality. Further refinement and commercial development of this startlingly simple exchange technique promises to revolutionize the whole field of deionization, according to Rohm & Haas.

Probably the purest water ever prepared was that used in 1894 by Kohlrausch and Heydweiler in their classic determination of the ionization constant of water. By tedious, repeated distillations in special equipment, they obtained a product with an electrical resistance of over 23 million ohms per centimeter. Today, water of only slightly lower purity may be obtained by simple filtration through a mixture of Amberlite cation and anion exchange resins. By the use of this method, it is now possible to produce a deionized water equivalent in chemical purity, insofar as freedom from ionic impurities is concerned, to a triple-distilled product.

Take Delaware River water, for example. It has an average hardness (as $CaCO_3$) of 69 ppm. Yet passage of Delaware water through resin beds regenerated to only 50 percent of capacity delivers water with an electrical resistance of 10 million ohms per centimeter. This quality, of course, is obtained otherwise only by repeated distillation.

Mixed-bed deionization, a revolutionary departure from present methods of deionization, involves the simple filtration of the solution to be treated through an intimate mixture of two volumes of Amberlite IRA-400 (hydroxyl form) and one volume of Amberlite IR-120 (hydrogen form). A mixed bed of this type may be regarded as a multiple-bed deionization unit consisting of countless numbers of cation and anion exchange columns arranged alternately in a series.

Advantages of this new technique over the conventional two-bed deionization methods now generally employed are claimed to be: (1) extraordinary quality of effluent; (2) constant maintenance of a neutral pH during deionization; (3) lower costs of equipment; (4) lower costs of regeneration; (5) lower rinse requirements; (6) uniform performance in intermittent service; and (7) sharp breakthrough at depletion of the bed.

IR-120 is a strongly acidic cation exchange resin capable of adsorbing metallic ions from solution while releasing an equivalent amount of hydrogen ions. IRA-400 is a strongly basic resin that splits salts in an exactly opposite sense. It adsorbs the chloride, sulphate, carbonate and other ions from solution, releasing an equivalent amount of hydroxyl ions. Thus the intimate mixture of the two resins produces an effluent water essentially free of all ionized materials.

Already, mixed-bed systems are being used for de-ashing carbohydrate solutions, purifying whey and fractionating human blood serum. Further uses for this new exchange method are being investigated in such varied fields as agriculture, sanitation, textiles, petroleum refining, brewing and the manufacture of cosmetics. Water equivalent in ionic purity to a triple-distilled product, as delivered by this technique, is regarded as entirely suitable for the rinsing operations employed in electroplating automobile accessories, in manufacturing photographic film, in preparing mirrors for

silvering, and in diluting hydrogen peroxide. A host of other applications for the method are being uncovered daily in industries in which it is necessary to effect complete removal of inorganic salts at pH 7.0.

Most of the objectionable features and operational limitations of conventional two-bed systems are eliminated by the mixed-bed method, and it is expected that this new technique will extend the use of ion exchange materials into scores of fields where these unique tools have hitherto been inapplicable.

Rohm & Haas Co., Resinous Products Division, Washington Square, Philadelphia 5, Pa.

FOR WOOL:

Line of Dyestuffs

Dyeing wool without decreasing its fiber elasticity or strength is a ticklish job. But General Aniline & Film's new line of Helindon dyestuffs does just that.

Yard dyed with these dyestuffs shows better elongation. What's more, fabrics dyed with Helindon dyes have tested 10 percent stronger in the filling and 25 percent stronger in the warp than materials dyed with chrome colors.

The Helindon dyes have superior fastness to perspiration and washing. The full line of 13 dyestuffs is offered through General Dyestuff Corp., General Aniline's sales agent.

General Aniline & Film Corp., 230 Park Ave., New York 17, N. Y.

IMPARTS WET STRENGTH:

Aminoplast Resin

A new paper wet-strengthening resin, which is reported to provide decided advantages over the urea and melamine resins now used for this purpose, has been announced by the Plaskon Division of Libbey-Owens-Ford Glass Co. The new resin, though neither a straight urea nor a melamine, is chemically related to both. It is described by the company as an aminoplast.

Plaskon aminoplast is now in commercial use in a number of paper mills throughout the country. It is now being successfully used in paper draperies, diaper stock, kraft bags, delicatessen and butcher papers, and toweling.

Although costing somewhat more than urea resin, it supplies about twice the wet strength that an equal amount of urea does. For a given degree of wet strength, some mill users report that only one-half as much Plaskon aminoplast is required. The total cost for the same degree of wet strength is therefore much less when aminoplast is used instead of urea.

In comparison with melamine wet-strengthening resins, decided cost advantages are also secured by using aminoplast. Using both in equal amounts, aminoplast yields a wet strength equal to that imparted by melamine with sizeable cost savings. When extremely high wet strengths are desired, additional aminoplast can be used, always yielding a higher ratio of wet strength to cost than is possible with melamine.

Plaskon aminoplast is particularly recommended for headbox addition where it is added to the paper stock just before it reaches the fourdrinier wire. It has been learned that such procedure eliminates the adverse effect of adding wet-strengthening resins to the beater, in which case the impact effect of the beater and the later effects of the Jordan tend to wipe the resin off the fibers, leaving them merely in solution.

Libbey-Owens-Ford Glass Co., Toledo 6, Ohio.

This Month . . .

The following pages are chock-full of interesting information on other new products . . . For example, on p. 164 there's news of a silicone coating that withstands heat and exposure to weather . . . To safeguard surfaces from mold and mildew attack, a new high-gloss enamel, described on p. 164, has a fungicide incorporated in it . . . Tanners can now get a synthetic resin to help them in tanning suede and other leathers. It produces plumping with minimum shrinkage. See p. 166 . . . If you're engaged in the manufacture of greases, turn to p. 168 to discover how an aluminum stearate gelling agent can cut your soap costs as much as 50 percent . . . See p. 168 for news of two new forms of vitamin B_{12} concentrates . . . And on p. 170 you'll learn about the possibilities of dioctylphosphoryl chloride, new organic intermediate.

Next Month . . .

Watch for the announcement of more new products and materials with widespread applications next month . . . Among those to be described are a silicone mold release emulsion, a wax for incorporation in organisols, and a hydrophobic corn starch derivative.

LOOKS LIKE PUTTY

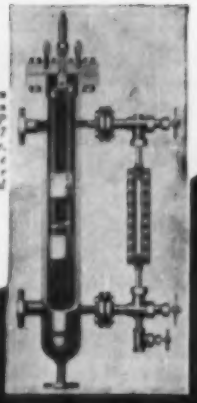
Alkyd Plastic

A new addition to the family of alkyd plastics, first introduced a year ago, has been announced by the Plaskon Division of Libbey-Owens-Ford Glass Co. The new material, designated as Plaskon Alkyd 411, is unique among plastics in that it is supplied as a putty, not in the conventional granular or powder form.

The new alkyd material can be molded into finished form at pressures far lower than any other plastic material. Molding pressures as low as 50 psi. are being used commercially. For demonstration purposes, the material can be literally molded by hand and subsequently cured to a hard, heat-resistant solid by brief heating. On a production basis, lightweight, fast-acting hydraulic or air-actuated presses are employed that carry out the complete molding cycle on a high production basis.

Because of the extremely low pressure requirements, Alkyd 411 is particularly suited to applications where a shell of plastic must be molded around delicate electrical assemblies that would be crushed by the high pressures necessary to mold other plastics. Electrical capacitors, required in large quantities by the television, radio and other electronic industries, are a typical use of the new compound. Paper condensers and wound resistors are other successful applications of Alkyd 411.

The new Plaskon Alkyd is supplied to molders in bulk as a putty. At room temperatures it is readily extruded into ribbons or other required shapes. These, in turn, are cut into individual pieces that serve as mold charges. This technique permits molders to pre-assemble a condenser or capacitor just before molding and to produce an integral piece with all components, including wire leads, sealed into a stable, moisture-resistant, heat-resistant unit. *(Continued)*



Jerguson Water Column with 7-HP Gage and A-37 Drain Valve. Available complete, or as individual units.

JERGUSON WATER COLUMNS Give Positive Alarm Signals

Keen Knife-Edge Balance Holds Key To Outstanding Jerguson Performance

YOU'RE sure of positive boiler alarms with JERGUSON WATER COLUMNS . . . because keen *knife-edge balance* assures immediate action.

Positive action is necessary when boiler water level falls too low or rises too high in your boiler. Jerguson's camshaft arrangement exerts sufficient force to give the power to assure action under all conditions. The warning whistle blows *immediately* when the limit is reached in either direction.

The alarm mechanism on JERGUSON WATER COLUMNS is stainless steel throughout. Valve stem, cam, and knife edges are carefully hardened. A complete range of pressures and sizes, with screwed, flanged, or welding connections. There's a dependable JERGUSON WATER COLUMN to fit your requirements.

Write today, without obligation, for complete DATA UNIT on Jerguson Water Columns

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A new concept of compression molding was introduced to the plastics industry a year ago by Plaskon with its announcement of the family of alkyd molding materials. All members of the family are moldable into finished parts on equipment that is far lighter and less expensive than conventional compression presses. The original alkyd, a granular compound, has gained wide acceptance. It is now being used in large quantities in the making of television components, switch gear, fuse plugs, terminal blocks and machine parts.

Four machinery manufacturers will shortly introduce molding machines specifically designed for alkyds. Pilot models of these machines are today in commercial use in a number of plants.

Mechanical and electrical properties of Plaskon Alkyd 411 are similar to those of the granular alkyd. The new compound, however, has somewhat shorter storage life.

Libbey-Owens-Ford Glass Co., Toledo 6, Ohio.

WITHSTANDS HEAT:

Silicone Coating

Latest addition to the line of specialty protective coatings made by the Dampney Co. of America is Dampney Silicone Coating Aluminum. It can be used for service where it is exposed to the weather, and it is capable of withstanding temperatures up to 750 deg. F.

This new product utilizes to the fullest extent the unique characteristics of silicone resins. These semi-organic materials combine high inertness and heat stability with unusually high water repellency and low moisture absorption to provide heat- and weather-resistant surfacing of outstanding durability.

Dampney Silicone Coating is formulated to withstand either continuous exposure to heat or intermittent heating and chilling, and all conditions of weather exposure, as well as chemical-fume attack. It is, therefore, suited for outdoor service in industrially contaminated atmospheres, as well as for exposure to atmosphere even though under shelter. It is recommended for application to such equipment as stacks, furnaces, boilers, heaters, ovens, steam lines, gas burners and exhaust mufflers.

The fluid consistency of Dampney Silicone Coating Aluminum gives the material good workability. Its high spreading rate permits rapid and easy application by brush or spray to any reasonably well-prepared iron, steel, galvanized, or other metal surface, either new or previously in service. Recommended coverage is 1,000 sq. ft. a gal. Drying time of ½ to 3 hr. holds equipment down-time to a minimum.

Dampney Co. of America, Hyde Park, Boston 36, Mass.

LICKS MOLD AND MILDEW:

High-Gloss Enamel

To control mold and mildew growths during its entire service life is the function of a high-gloss enamel developed by the Glidden Co. for use in dairies, bakeries and other similar food processing plants.

Called San-I-Seal, the new product contains a water-insoluble fungicide that does not evaporate or leach out. It dries to a hard, firm surface that will not soften from moisture and allow dust containing food particles, on which fungus spores feed, to adhere to the surface.

Although designed primarily for interior use, San-I-Seal may be applied to exterior surfaces—if the exposure is not severe, such as on ceilings of loading platforms—without affecting its fungi-preventive qualities. It is extremely washable.

Glidden paint technicians point out that mold and mildew are a serious problem in bakeries, dairies, packing houses, textile plants, breweries, bottling works and other food processing units, where the fungi frequently cause extreme discoloration of ordinary coatings. In addition, fungi frequently form organic acids that hydrolyze ordinary paint films and afford easy access to the bare wood for the wood-destroying fungi.

Protection against fungi is provided by San-I-Seal for the average period of a good paint job, several years in many instances.

It is produced only in white, although it can be tinted. It can be either brushed or sprayed on the surface. One coat is usually sufficient on previously painted surfaces.

Glidden Co., 11001 Madison Ave., Cleveland 2, Ohio.

SOFT-FLOW:

Acrylic Molding Powder

Designated as Plexiglas VS, a new soft-flow acrylic molding powder is now being offered in commercial quantities by Rohm & Haas Co. It affords outstanding moldability combined with water-white clarity equal to that of the heat-resistant V and medium-flow VM molding powders.

Addition of the soft-flow VS, as a general-purpose formulation for

(*Continued*)

From SHELL CHEMICAL-

IONOL*

A tri-substituted hindered phenol of high chemical purity

THE ANSWER TO MANY OXIDATION PROBLEMS

Are you troubled by—

. . . **rubber staining or discoloring?** IONOL guards rubber products against oxidation, *even through long exposure to light, air and heat.*

IONOL is non-discoloring in light-colored rubber goods . . . non-staining to rubber-guarded parts. This highly compatible and effective anti-oxidant can be readily included in the recipes you are now using.

. . . **plastics deterioration?** IONOL *can help* inhibit product changes due to oxidation . . . such as brittleness, loss of texture and discoloration.

. . . **poor "keeping" ability of animal and vegetable oils?** Minute quantities of IONOL can prevent rancidity . . . can maintain normal color and appearance in both oils and prepared esters.

. . . **unreliable anti-skinning properties of paints and inks?** IONOL permits controlled *retardation* of skin formation.

. . . **weakening of botanical insecticides?** Small quantities of IONOL extend the high-potency life of pyrethrum and other important insecticides.

. . . **brake fluid corrosiveness?** IONOL is an effective inhibitor for brake fluids.

SPECIFICATIONS

Purity (minimum)	98%
Freezing Point (minimum)	68.5°C

% SOLUBILITY OF PURE COMPOUND BY WEIGHT AT 20°C IN:

Absolute ethanol	26%
Isopentane	50%
Benzene	40%
Castor oil	20%
Coconut oil	29%

A LETTERHEAD REQUEST will bring you further information and a sample of IONOL for your own tests.

*Trade Mark registered, U.S. Patent Office

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NEW!

C-O-TWO

DRY CHEMICAL TYPE FIRE EXTINGUISHER

EXCLUSIVE DESIGN

assures you of fast, positive fire protection

SELF-CONTAINED UNIT . . . rugged construction . . . no extra gadgets protruding or complicated operating parts . . . one of the most efficient, foolproof, easy-to-use fire extinguishers known . . . two convenient sizes, 20 pound capacity and 30 pound capacity.

C-O-TWO DRY CHEMICAL STAYS FREE FLOWING . . . no syphon tubes or valves within the cylinder to become clogged or inoperative . . . discharge hose and squeeze type discharge nozzle remain empty until the fire extinguisher is actuated. Inverting the fire extinguisher before using provides mechanical breakage by changing the position of the dry chemical in the cylinder. Bumping to actuate the fire extinguisher provides additional mechanical breakage as well as continuous carbon dioxide gas pressured agitation or fluffing of the dry chemical. These combined features plus a skillfully blended free flowing extinguishing agent assure you of a faster, more effective and complete discharge.

APPROVED . . . Underwriters' Laboratories, Inc. rating is B-1, C-1. C-O-TWO Dry Chemical is non-conducting, non-corrosive, non-abrasive, non-freezing and non-toxic . . . highly effective on flammable liquid and electrical fires.

RECHARGEABLE ON-THE-SCENE . . . no special tools needed . . . one piece removable top assembly leaves large unobstructed opening in the top of cylinder for refilling. C-O-TWO Dry Chemical for recharging is available in handy pre-measured moisture proof containers.

Write today for complete free information on this new, quick-acting fire extinguisher . . . no obligation.

C-O-TWO FIRE EQUIPMENT COMPANY

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Sales and Service in the Principal Cities of United States and Canada

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NEW PRODUCTS, *cont. . .*

molded parts where high service temperatures are not required, completes the line of V grade injection powders made by Rohm & Haas.

Physical and chemical properties are similar to those of the medium-flow VM powder. Heat distortion temperature of the new powder under standard ASTM test (2 deg. C. per min. at 264 psi.) is 66 deg. C., compared with 79 deg. C. for Plexiglas VM. Ease of working of the new VS powder promises lower molding temperatures and the possibility of faster cycling.

Rohm & Haas Co., Washington Square, Philadelphia 5, Pa.

FOR PLUMPING:

Tanning Aid

Manufacturers of agents used in the tanning of kid, goat and, particularly, suede and crushed grain leathers will be interested in the properties of Polyco 360, the new synthetic resin tanning aid developed by American Polymer Corp. It produces pronounced yet controllable plumping with minimum shrinkage.

A product of modern resin technology, Polyco 360 is a non-molding, non-deteriorating solution that can be infinitely diluted with water. Because of its properties, solutions formulated with Polyco 360 are stable, homogeneous and inexpensive.

American Polymer Corp., 101 Foster St., Peabody, Mass.

PROTECTS METALS:

Vinyl Coating

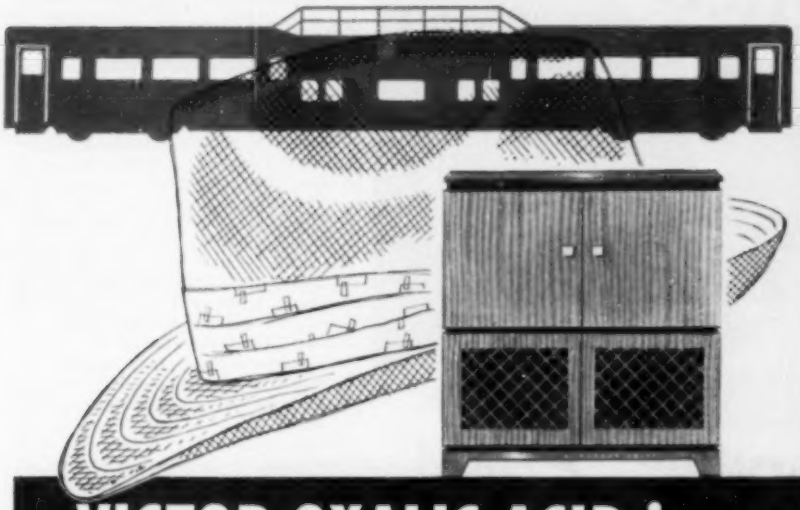
Protecting metals and metal parts from corrosion, scratching and abrasion during production, assembly, shipping and storage is a constant problem that engineers are up against. To help lick it, Specialty Coatings Laboratory now offers a removable protective coating made of vinyl.

The coating is custom-formulated to meet specific end-uses. It can, for example, be used in masking or stop-off lacquers and in protective films for polished metals. For the latter application a corrosion-inhibitive composition has been developed to retard under-film corrosion.

Applicable by spray, brush or dip methods, the coating is available clear and in a variety of colors, both translucent and opaque. A sprayed coating has a coverage of 250 to 300 sq. ft. per gal. per mil thickness. It can be air-dried or force-dried to provide a high degree of protection against weather,

(Continued)

from **RAIL CAR CLEANING... TO STRAW AND WOOD BLEACHING**



VICTOR CHEMICALS FOR INDUSTRY

Aluminum Formate
Aluminum Phosphates
Monoammonium Phosphate
Diammonium Phosphate
Monocalcium Phosphates
Hicalcium Phosphate
Dicalcium Phosphate
Tricalcium Phosphate
Ferric Orthophosphate
Sodium Iron Pyrophosphate
Ferrophosphorus
Formic Acid
Oxalic Acid
Phosphoric Acids
Carbamide Phosphoric Acid
Phosphoric Anhydride
Phosphorus
Phosphorus Oxychloride
Phosphorus Trichloride
Potassium Phosphates
Hemisodium Phosphate
Monosodium Phosphate
Disodium Phosphates
Trisodium Phosphate
Tetrasodium Pyrophosphate
Sodium Tripolyphosphate
Sodium Acid Pyrophosphate
Sodium Formate
Sodium Oxalate
Stabilizers
Tetraethyl Pyrobate
Wetting Agents

VICTOR OXALIC ACID is preferred

The versatility and popularity of oxalic acid are indicated by its wide range of uses. Today, Victor oxalic acid is employed in:

- **Leather Processing**
- **Cleaning Railroad Cars**
- **Radiator Cleaning Compounds**
- **Laundry Sour, for Neutralizing Alkali, Discharging Bleach, and Removing Iron Stains**
- **Bleaching Straw, Wood, Cotton Linters**
- **Removing Rust Stains from Marble**
- **Purifying Rosin**
- **Manufacture of Metal Polishes**
- **Manufacture of Candles, Varnish, Paper, Textiles**

Victor oxalic acid is a brilliant, transparent, colorless, crystalline material. It is a strong acid in convenient, dry form. Typical quality: Assay (min.) 99.8%, $(COOH)_2 \cdot 2H_2O$, SO_4 (max.) 0.05%. Solubility: 12.5 parts in 100 parts water at 25°C. Available in barrels or fiber drums.

Write for technical data and experimental sample.

VICTOR CHEMICAL WORKS

141 West Jackson Boulevard • Chicago 4, Illinois

INDUSTRIAL USES OF VICTOR CHEMICALS

Baking Powders
Bread—Yeast
Ceramics—Glass
Evaporated Milk
Cookies—Crackers
Cosmetics
Denture Cleaners
Detergents
Dyeing
Flameproofing
Food Enrichment
Insecticides
Laundering
Leather Tanning
Metals and Alloys
Metal Cleaning
Metal Plating
Nutrient Solutions
Oil Drilling Muds
Organic Chemical Mfr.
Paint—Varnish
Petroleum Refining
Pharmaceuticals
Phosphated Flour
Plastics
Prepared Flour Mixes
Process Cheese
Pulp and Paper
Pyrotechnics—Munitions
Rustproofing
Salt
Self-Rising Flours
Soaps
Soft Drinks
Sugar
Textile Processing
Tooth Powder & Paste
Water Proofing
Water Treatment

No LOST PARTICLES in
U.S. STANDARD SIEVE SERIES
NEWARK
NEWARK A.S.T.M.
Testing Sieves
NEWARK ACCURACY
• NO CREVICES between cloth and frame to catch and thus "lose" particles.
• EXACT OPENINGS. Newark Standard Testing Sieves are made to conform to the latest specifications of the National Bureau of Standards.
• CLOTH STRONG and DURABLE. We weave the metal cloth in our own plant, thereby controlling its quality.
• RE-COVERING SERVICE. When the wire cloth is worn out return the sieves for re-covering. Often there is a saving.
Our new four page folder gives complete details and specifications. May we send you a copy?
Newark Wire Cloth COMPANY
350 VERONA AVENUE • NEWARK 4, N. J.

corrosive elements, aging and abrasion. The coating can be peeled off, leaving a clean dry surface. Alternatively, the vinyl material can be obtained as an adherent coating for permanent protection.

Specialty Coatings Laboratory, 1721 North Water St., Milwaukee 2, Wis.

GELLING AGENT:

Aluminum Stearate

To its line of metallic soaps Mallinckrodt Chemical Works has now added Aluminum Stearate Technical D-50. Developed primarily for use in the lubricating grease industry, this new aluminum stearate offers the maximum in efficiency and gel stability.

Of particular interest to all industries using aluminum stearates as gelling agents is this fact: soap costs may be reduced as much as 50 percent through the use of D-50.

Laboratory and field trials with a variety of oils, conducted under many different operating conditions, have shown that D-50 greases, even at low soap concentrations, possess good resistance to mechanical breakdown upon working. Moreover, these D-50 greases have high dropping points, even texture and superior resistance to bleed.

Mallinckrodt Chemical Works, St. Louis 7, Mo.

IN TWO FORMS:

Vitamin B_{12} Concentrates

Two new vitamin B_{12} concentrates, of interest to the pharmaceutical industry, are announced by Chas. Pfizer & Co., Inc.

To provide other manufacturers with the most economical and usable forms of this vitamin, Pfizer will market both a Parenteral Grade Solid and an Oral Grade Solid of vitamin B_{12} concentrate. Both products, produced by fermentation processes, will be offered as stable, dry concentrates.

The Parenteral Grade Solid is designed for use in the manufacture of sterile solutions of vitamin B_{12} for parenteral injection. It is supplied as a reddish-pink material of uniform bulk, and is readily soluble in water, giving clear solutions. This parenteral grade has a potency of not less than 30,000 micrograms of vitamin B_{12} per gram by the L.L. microbiological assay.

The Oral Grade Solid, designed for use in tablets and capsules, will be supplied as a light-brown, free-flowing powder of uniform bulk. This ma-

(Continued)

FOR UNIFORM HIGH QUALITY SPECIFY...

Blockson's patented processing method keeps every shipment uniform —sample, bag or carload. Your results are always the same.

BLOCKSON SODIUM TRIPOLYPHOSPHATE

FORMULA: $Na_5P_3O_{10}$
STRENGTH: P_2O_5 57% pH of 1% solution 9.7
SOLUBILITY: 75° F 45 parts in 100 parts water

BLOCKSON TRIPOLYPHOSPHATE offers the chemical industry an effective combination of water softening, dispersing and sequestering properties *plus* a high compatibility with varied mixtures. The ability of its aqueous solutions to disperse viscous or gummy materials, and in general, to deflocculate, suspend and otherwise modify water insoluble substances . . . suggests experimental application to your own particular problem. Bulletin and sample on request

WATER SOFTENING

Blockson STPP saves soap by softening hard water so that the soap can not react with the calcium and magnesium.

THRESHOLD TREATMENT

Threshold additions of a few parts per million inhibit precipitation of the calcium and magnesium hardness elements.

DISPERSION

Its dispersing properties help in forming a stable suspension of the dirt in laundering operations . . . thus preventing its redeposition on the washed articles, even during the rinsing operation.

SEQUESTRATION

The sequestered calcium and magnesium is held in a soluble combination—not affected by addition of substances that normally precipitate these hardness elements.

STABILITY

Blockson STPP is stable through a wide range of temperatures—even in hot alkaline solutions under normal conditions of use. It retains its sequestration properties indefinitely at room temperatures.

HYGROSCOPICITY

Its low hygroscopicity keeps Blockson STPP free flowing under normal conditions of use. It can be conveniently stored or handled and accurately measured in its dry state.

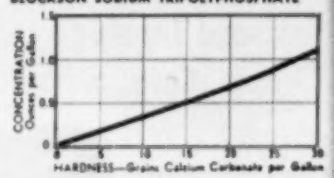
PRINCIPAL USES

An ideal detergent by itself.
A soap builder.
—bar soaps, chips, industrial cleaners.
Adjunct to synthetic detergents, sudsing agents, soaps.
Dishwashing compounds.
Cleaning compounds for dairies, metals and textile processing.
Viscosity reducer for muds in oil well drilling.
Dye penetrant for uniform textile dyeing operations.
Purifier and disperser of clays for coating paper.

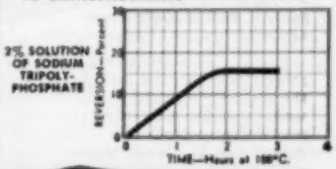
OTHER BLOCKSON CHEMICALS

- Tetrasodium Pyrophosphate Anhydrous
- Sodium Polyphos
- Sodium Hexametaphosphate
- Sodium Tetraphosphate
- Sodium Silicofluoride
- Trisodium Phosphate, Crystalline
- Chlorinated Trisodium Phosphate
- Trisodium Phosphate, Monohydrate
- Disodium Phosphate, Anhydrous
- Disodium Phosphate, Crystalline
- Monosodium Phosphate, Anhydrous
- Monosodium Phosphate, Monohydrate
- Sodium Acid Pyrophosphate
- Light Alumina Hydrate
- Gloss White
- Sulfuric Acid

Sequestration and Water Softening Capacity
BLOCKSON SODIUM TRIPOLYPHOSPHATE



REVERSION OF SODIUM TRIPOLYPHOSPHATE TO ORTHOPHOSPHATE



FOR BULLETIN OR SAMPLE, MAIL COUPON

Aerial view of BLOCKSON'S vast 200 acre site where the entire BLOCKSON organization is coordinated into a closely knit group under intimate executive supervision for prompt service to American industry, large and small.

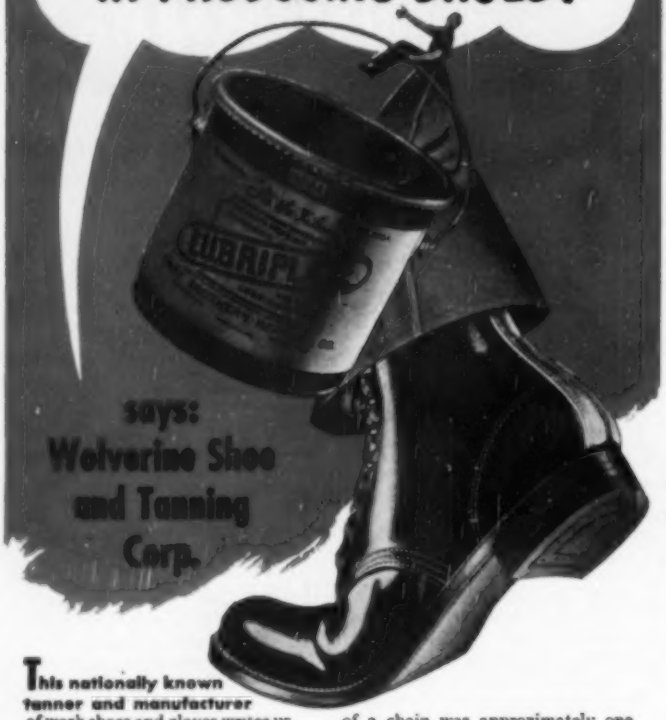
BLOCKSON CHEMICALS

BLOCKSON CHEMICAL CO., Dept. CE-1, Joliet, Illinois

☐ Send Bulletin on Blockson Tripolyphosphate
☐ Send sample without obligation

Name.....Title.....
Company.....Street.....
City.....Zone.....State.....

THIS LUBRICANT SAVES 7 TIMES ITS COST IN PRODUCING SHOES!



This nationally known tanner and manufacturer of work shoes and gloves writes us . . .

". . . You recommended to us LUBRIPLATE NO. 100 for lubricating the chain drive on our paddle wheels which turn the hides immersed in a solution in concrete vats. The chain, during use, is always soaked. The solution is sometimes acid and sometimes caustic. Up to the time of your recommendation, we had not found any lubricant that would stay on the chains for any appreciable time.

"Heretofore, the average life of a chain was approximately one year. We have applied LUBRIPLATE to these chains every two weeks for two years. Since then, not one new chain has required replacement, and they are still going strong.

"At this time it appears that *for every dollar we have invested in* LUBRIPLATE, *we have saved seven dollars* in chains with actual savings still to come."

WOLVERINE SHOE & TANNING CORP.
Rockford, Michigan

You, too, can enjoy the savings made possible with LUBRIPLATE Lubricants. There is a LUBRIPLATE product for every industry. LUBRIPLATE reduces friction and wear, prevents rust and corrosion and is most economical to use. Write today for case histories of savings made possible by the use of LUBRIPLATE Lubricants in your industry.

LUBRIPLATE DIVISION • Fiske Brothers Refining Company
Newark 5, New Jersey • Toledo 5, Ohio

DEALERS EVERYWHERE • SEE YOUR CLASSIFIED TELEPHONE BOOK

LUBRIPLATE the Modern Lubricant

terial is suitable for oral administration and has a vitamin B_{12} potency of 500 micrograms per gram as determined by L.L. assay. It is particularly suitable for capsule or tablet manufacture, by standard procedures.

Both oral and parenteral materials are now available in the following package sizes based on the weight of vitamin B_{12} in the concentrate according to the L.L. assay method: 1 g., 500 mg., 100 mg., and 10 mg.

Chas. Pfizer & Co., Inc., 11 Bartlett St., Brooklyn 6, N. Y.

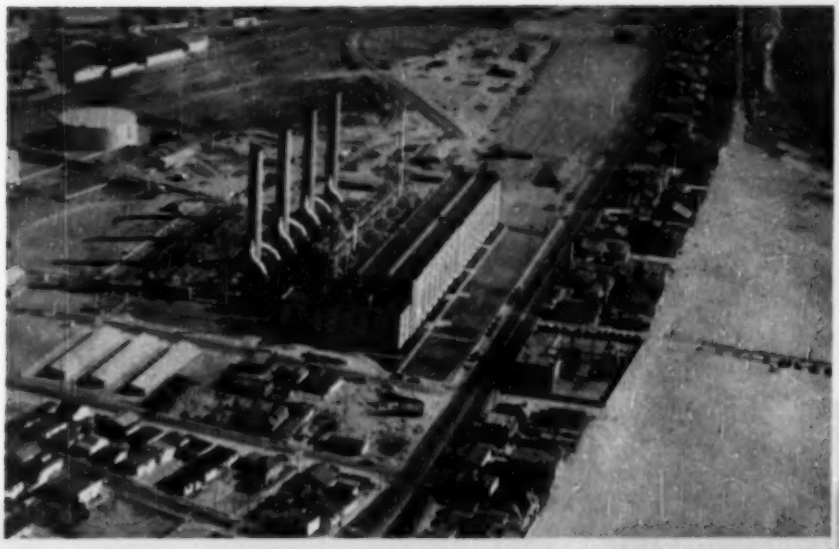
Briefs . . .

Four organics, each with possibilities as an intermediate in synthesis work, are offered by Heyden Chemical Corp. to supplement the first group of four, previously announced. Two of the newcomers, benzilic acid and para-benzyl phenol, are now commercially available. The other two, benzil and benzoin, can be obtained in pilot-plant quantities. Technical data and samples are available.
Heyden Chemical Corp., 393 Seventh Ave., New York 1, N. Y.

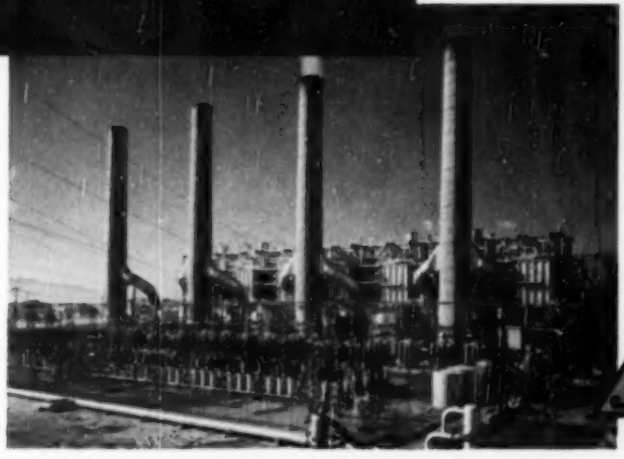
Odorants, called Alamasks, have just been introduced by Du Pont. For use in natural and synthetic rubbers, the series of odorants gives a wide range of sulphurous, smoky-smelling products the scent of mountain air after a summer shower. They may be employed singly or in combination. Concentrations from 0.1 to 0.01 percent, added during manufacture, are sufficient.
E. I. du Pont de Nemours & Co., Wilmington 98, Del.

Dioctylphosphoryl chloride is one of the newest intermediates for organic synthesis introduced by Victor Chemical Works. Its formula is $(C_8H_{17}O)_2POCl$, and it has a molecular weight of 341. Refractive index is N_D 1.4459, and its specific gravity is 0.9839 at 25 deg. C. Water-white to light straw in color, it boils at 125 deg. C. at 0.2 mm. Although insoluble in water, this compound is soluble in common organic solvents. It hydrolyzes readily in hot alkali to form sodium dioctylphosphote. The active chlorine atom is capable of reacting with alcohol, glycols and phenols to form neutral phosphorus-containing esters. Dioctylphosphoryl chloride is available in semi-commercial quantities. Victor Chemical Works, *141 West Jackson Blvd., Chicago 4, Ill.*

—*End*



HELPING TO MAKE THE WONDERS *of* SO. CALIFORNIA *more wonderful*



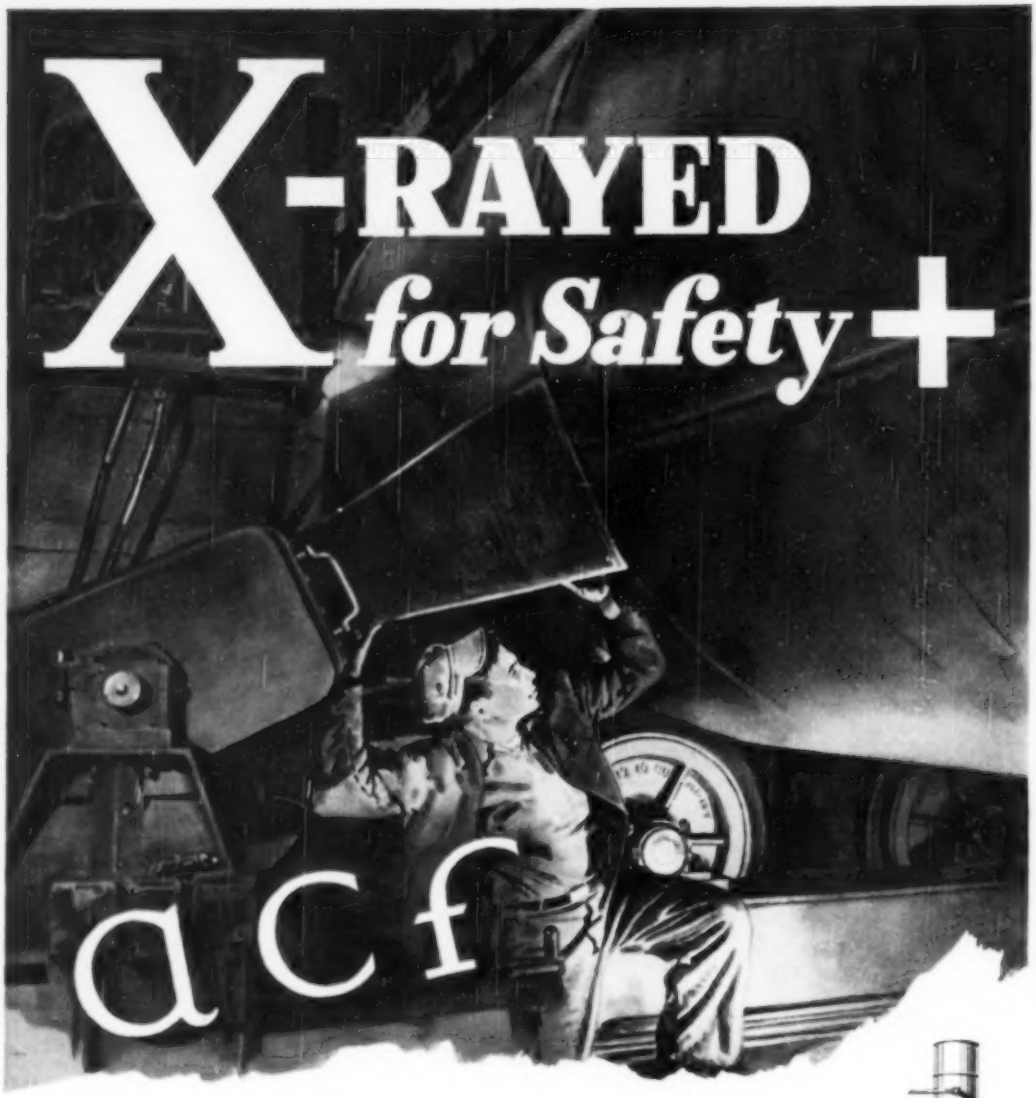
The 280,000 kw Redondo Steam Station was constructed to keep pace with the rapidly growing power demands of this region. Semi-outdoor design combines economy of construction with operating comfort and convenience and the entire structure has been built to resist the stress of possible earthquake shock. Unique is the provision for control of marine growth through thermal shock during periodic reversal of salt water flow in the two 2,000 foot intake and discharge tunnels which obtain condenser circulating water from the Pacific Ocean.

Stone & Webster Engineering Corporation designed and constructed the Redondo Steam Station for Southern California Edison Company.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY OF STONE & WEBSTER, INC.

X-RAYED *for Safety* +



Radiograph Interpretation

plays an important role in A.C.F. tank building. Standards for processing equipment, storage tanks, and tank cars are set well above I.C.C. or A.S.M.E. specifications. A.C.F. manufacture also calls for other exacting tests...elongation, tensile strength across the weld, and consistency of the weld itself...resulting in tanks that can take it! It's only natural that when you think of high quality processing equipment, storage tanks, and tank cars, you think of A.C.F.

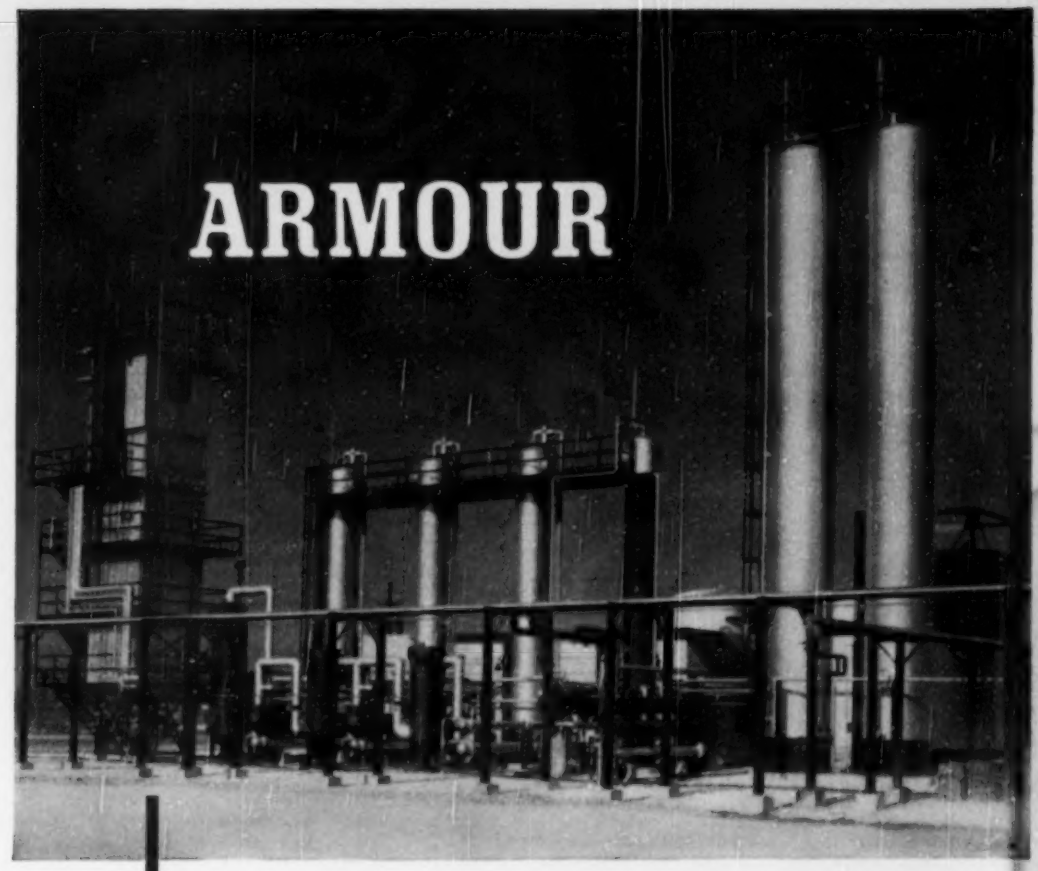
TANK CARS

STORAGE TANKS

PROCESSING EQUIPMENT

AMERICAN CAR AND FOUNDRY COMPANY

NEW YORK · CHICAGO · ST. LOUIS · CLEVELAND · WASHINGTON · PHILADELPHIA · PITTSBURGH · SAN FRANCISCO



Armour gets lower costs

with a **Girdler Hydrogen Plant**

AS A RESULT of years of research and development, Armour and Company has recently expanded its operations in the chemical field. An important part of this program called for a dependable, continuous supply of low cost hydrogen. That need has been met to a high degree of satisfaction by the modern Girdler *Hygirtol** Plant shown above, located at McCook, Illinois.

The hydrogen plant at McCook is the third Girdler *Hygirtol** Plant purchased by Armour and Company. All of these plants were designed and built by Girdler engineers.

Let Girdler serve *you* in your problems involving gas processes. Girdler designs and builds facilities to produce, purify or use chemical process gases, liquid and gaseous hydrocarbons, and organic compounds . . . Write for further information.

Works speak louder than words

*HYGIRTOL is a trade mark of The Girdler Corporation.

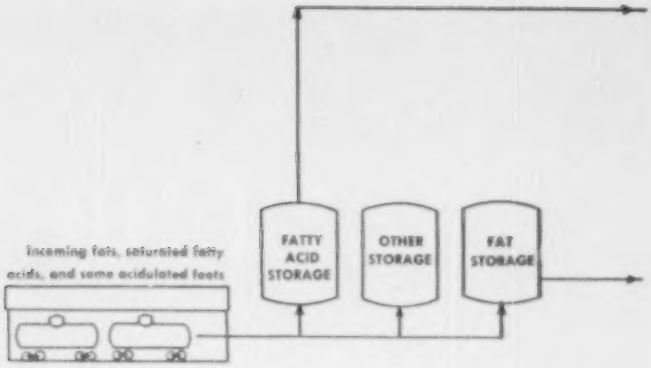
GAS PROCESSES DIVISION

THE GIRDLER CORPORATION

LOUISVILLE 1, KENTUCKY

Designers, Engineers and Constructors

A CHEMICAL ENGINEERING PICTURED FLOWSHEET



Fatty Acid Products

Article on page 124

This plant, completed last September by Armour & Co. at McCook, Ill., is the latest and most elaborate plant in the country for processing fats, oils and fatty acids. Part of the plant (see box on flowsheet) is quite similar to other recent installations; the diagram prepared here goes over the unusual branch of the operation, the production of nitriles, amines and one of their derivatives, amine acetate.

Raw materials are tallows, greases, fish oils, coconut oil, and fatty acid fractions of cottonseed and soybean oils. Conventional refining and bleaching tanks (not shown) are on hand for fats requiring treatment. Fats are hydrolyzed in a continuous Colgate fat splitter—an unpacked column where fat and water move countercurrently at 700 psi. and 500 deg. F.; at this high temperature and pressure the fats are hydrolyzed without resort to a catalyst. Bottom product from the splitter is sweet water, which is evaporated and the concentrated crude glycerin sent to another Armour plant for refining. Overhead from the splitter is fatty acids.

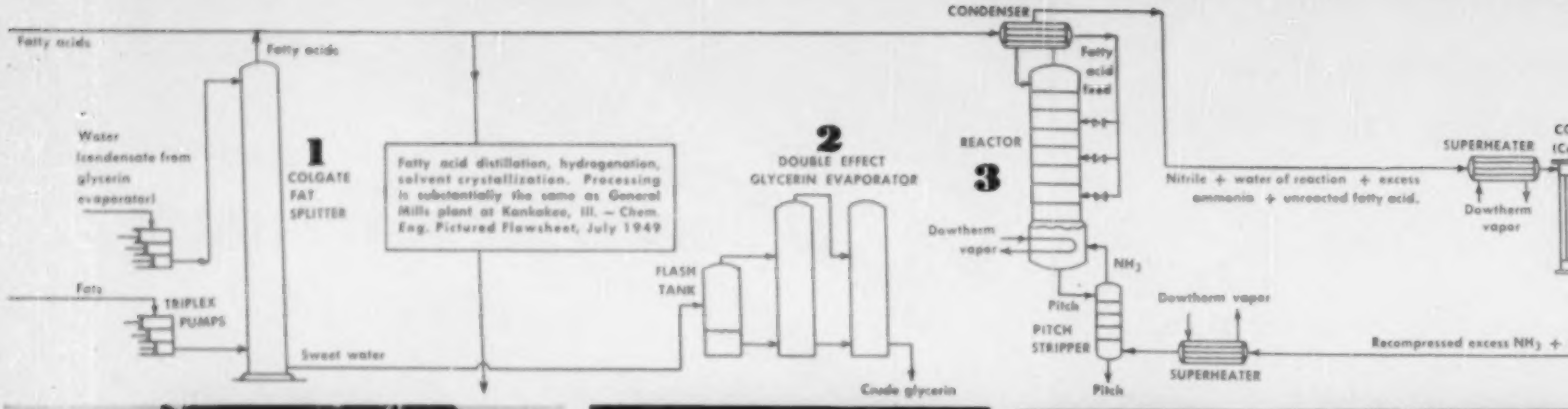
These fatty acids, and those shipped to the plant by rail, may go into the distillation section and on to hydrogenation, or they may be refined by solvent (acetone) crystallization. These sections are not diagrammed —the crystallization unit because it is not yet constructed, the distillation unit because it and subsequent hydrogenation were shown in last July's flowsheet on a similar installation.

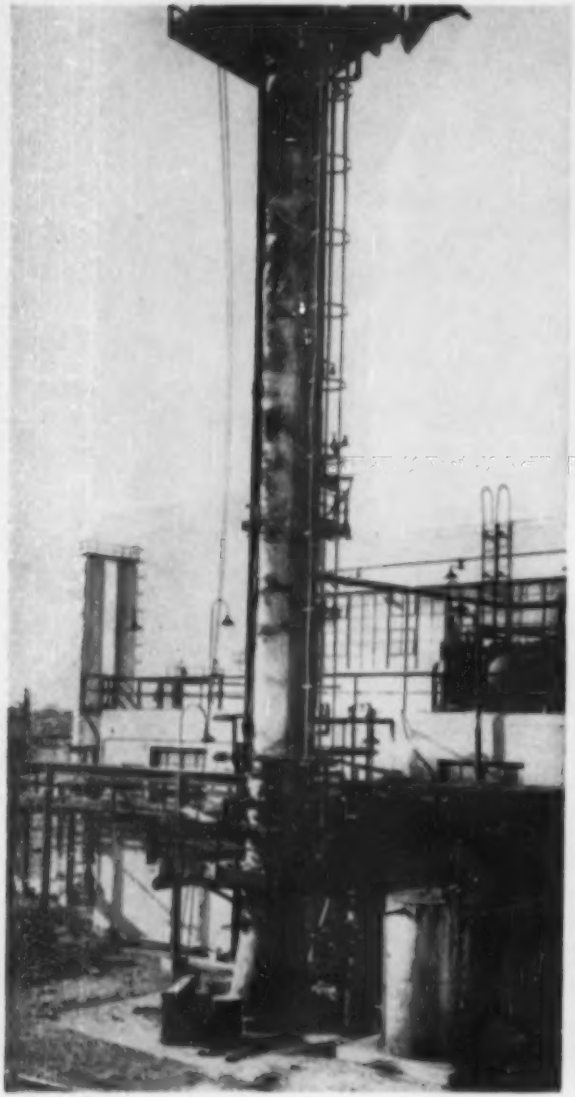
Distillation of the fatty acids is unnecessary when they are to be used for nitrile production. The nitrile reaction, $RCOOH + NH_3 = RCN + 2H_2O$, goes about 80 percent to completion in the reactor. This is a small bubble cap tower; fatty acids are preheated to 465 deg. F. and fed to whichever plate will give optimum performance; ammonia, preheated to 680 deg. F., passes first through a pitch stripper to sweep out any nitrile or unreacted fatty acid, then into the reactor below the liquid level. Pitch is the bottom product. Overhead is a vapor composed of nitriles, water of reaction and unreacted fatty acid and ammonia.

To complete the nitrile reaction, this overhead from the reactor is passed through tubes heated to 680 deg. F. and filled with aluminum oxide catalyst. Better than 99.5 percent of the fatty acid is thus converted.

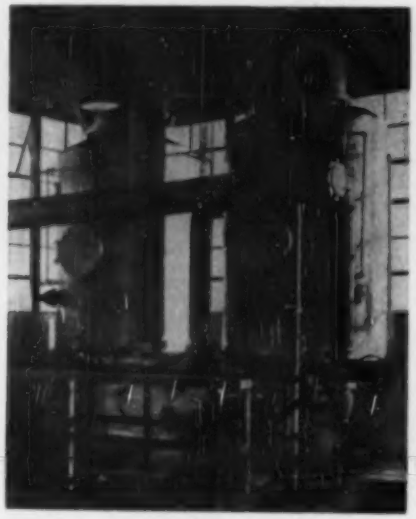
Water of reaction and the excess ammonia necessary to drive the reaction to completion are stripped from the nitriles. The water is condensed and the ammonia recompressed and used again. Crude nitriles may be sold as such or may be distilled. Distillation is accomplished in two towers (built one above the other for economy of construction and maintenance); 16-C nitriles are taken off one of the top half dozen plates of the upper tower, and 18-C nitriles are the vapor product of the lower. Bottoms product of the lower tower is returned as feed for the nitrile reactor.

Distilled nitriles may be sold or hydrogenated to make the amines. Hydrogenation autoclaves hold a 10,000 lb. batch of nitriles; they employ nickel catalyst, a temperature of 285 deg. F. and 250 psi. The amines may be distilled, in the same tower used to fractionate nitriles, or they may go on to be reacted with acetic acid to produce amine acetate.

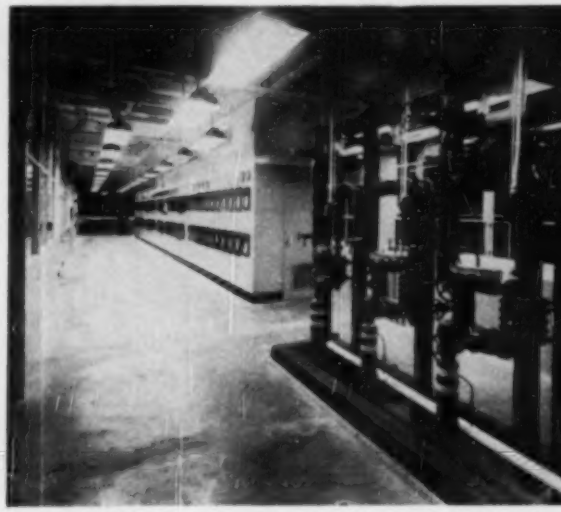




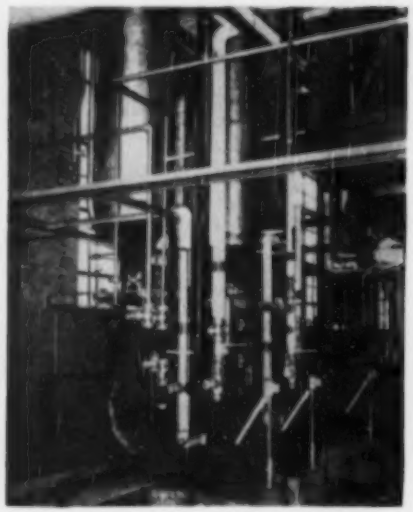
1 FAT SPLITTER. Colgate's continuous hydrolyzer is seen more and more. It produces at lower cost than older Twitchell batch process.



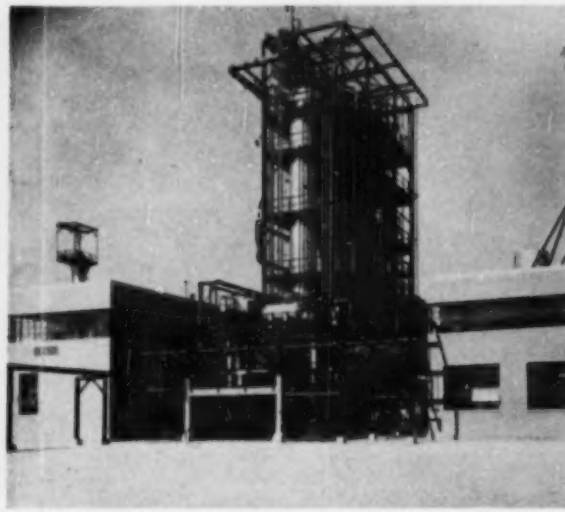
Top of glycerin evaporator. Condensate from second effect is used as process water for fat splitter.



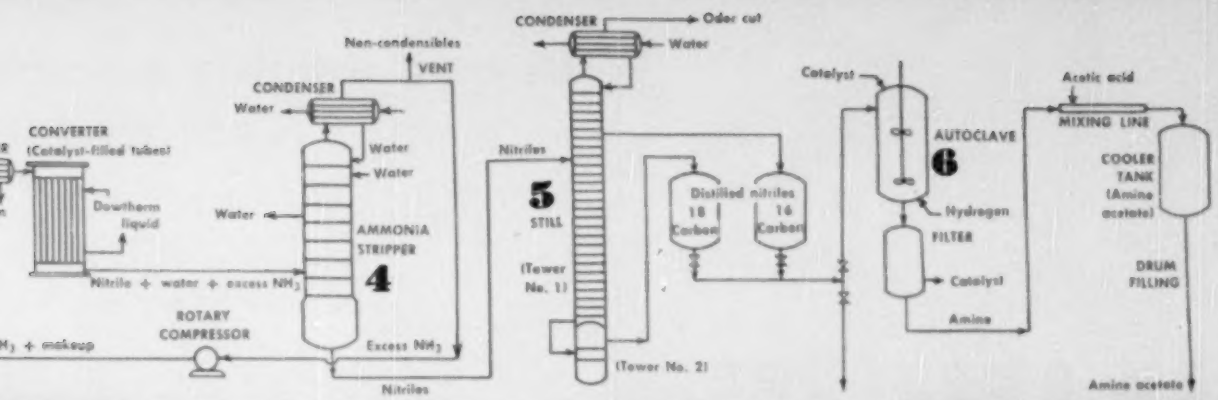
Nitrile and distillation control panel with handy arrangement (foreground) eters and sample connections. Three men per shift handle entire section.



2 GLYCERIN EVAPORATOR (BOTTOM). It is made of stainless steel to resist corrosion.



3, 4, 5 NITRILE & DISTILLATION AREA. Left to right: in and pump house (see photo above), still towers, Dowtherm



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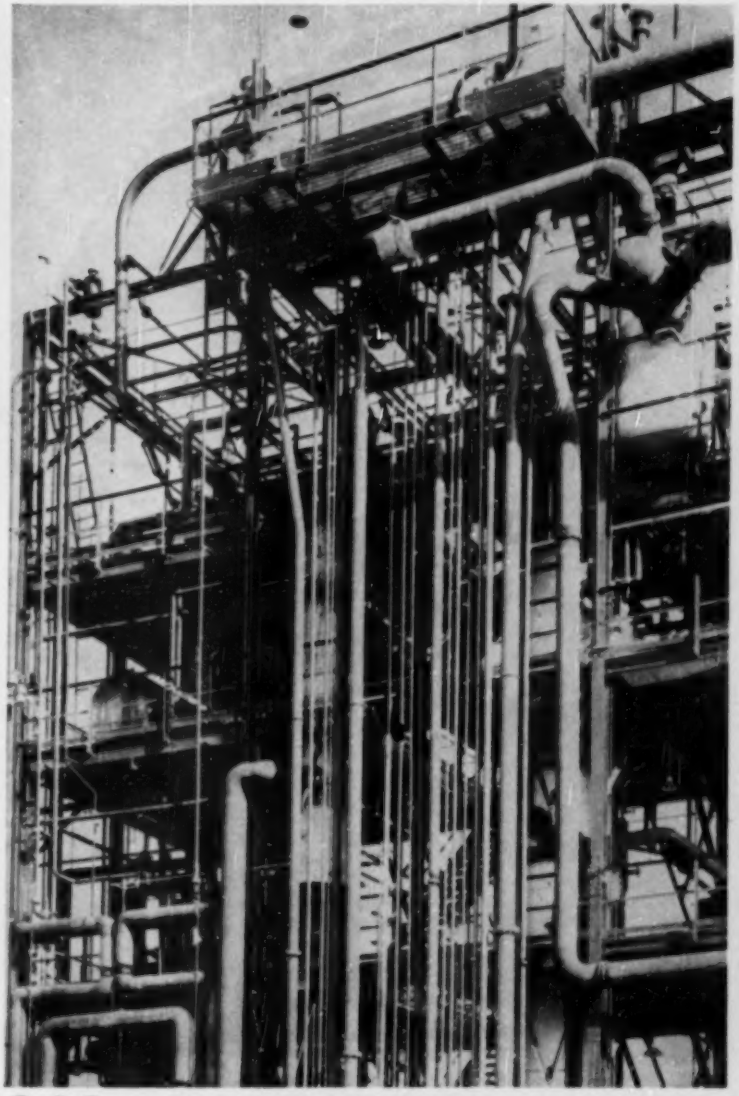
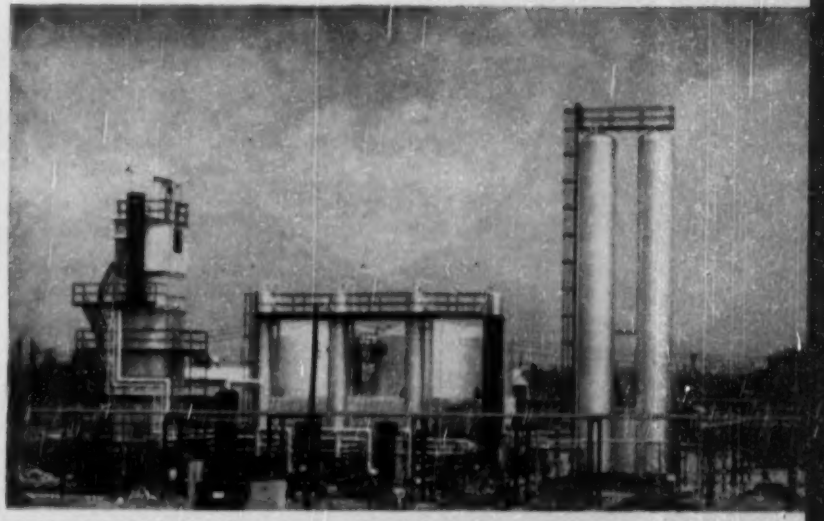
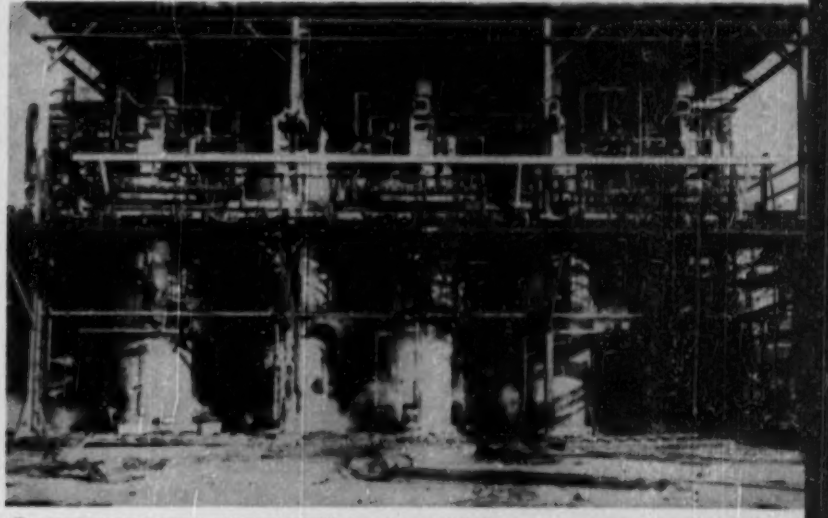


3.4.5 CLOSE-UP OF STILL TOWER. Behind skein of piping, and inaccessible to photographer, are nitrile reactor, ammonia stripper, nitrile and fatty acid stills.



HYDROGEN UNIT. Natural gas reformer produces hydrogen for use in hydrogenation building. Plant also produces its own nitrogen for blowing lines and blanketing product storage tanks.



6 HYDROGENATION AUTOCLAVES. Autoclaves and hydrogen piping are outdoors for safety. The two on left are for fatty acids, middle one for fats, two on extreme right for nitriles.

It was 1912—and Arizona was admitted to Statehood as the 48th State—when we introduced "Flexitallic," the *original* Spiral-Wound Gasket, and opened to Industry new fields of opportunity in the confining of fluids at high pressures and high temperatures.

WHEN A HIGH-PRESSURE GASKET FAILS...

What does it cost you when a high-pressure gasket fails? . . . In danger to personnel . . . damage to equipment . . . loss of operating time? Calculate the cost—*total*—and then decide whether you can afford to use anything less than the safest high-pressure seal.

It was just such calculations that convinced oil refineries, chemical industries, power plants, shipyards and steamship operating companies, and others who are *seriously* concerned with high pressures and high temperatures to standardize on Flexitallic, the original Spiral-Wound Gaskets.

They *know from experience.*

When you specify Flexitallic Gaskets, you set in motion scientifically devised controls for the determination of yield values, resilience and gasket density. You can see the results of Flexitallic precision — greater safety, gasket efficiency and economy of operations.

If you are *seriously* concerned with confining fluids safely and *do not know from experience* of the superior performance of Flexitallic Spiral-Wound Gaskets, write us on your company letterhead, giving us the following facts regarding your sealing requirements:

- (1) Fluid to be confined
- (2) Type of flange and dimensions
- (3) Operating pressures and temperatures
- (4) Bolting data

Within a few days you will receive a *genuine* Flexitallic Spiral-Wound Gasket with our compliments. Subject it to the most severe tests—in the laboratory or on the job . . . let your own *experience* tell you why nearly every industry *seriously* concerned with safe seals of high pressures and high temperatures is standardized on *genuine Flexitallic* Gaskets.

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The name "Flexitallic" is the registered trade mark identifying the *original* (patented) Spiral-Wound Gasket. Now—for your protection and ours—this trade mark FLEXITALLIC is stamped into the outer ply of every *genuine* Flexitallic Gasket. Your guarantee of quality.

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SPIRAL-WOUND GASKETS

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Take this Wood Preserving Unit, for example. Crane supplies everything for the system—valves, fittings, pipe and accessories. One order to Crane covers all your piping equipment needs . . . and results in better service. For Crane supplies you locally through a cooperating network of well-stocked Branches and Wholesalers having direct access to large factory stocks.

To standardize on this **Single Source of Supply** is to simplify every piping procedure, from design to erection to maintenance. **Complete Responsibility** on Crane for all materials makes for a better installation, avoids unnecessary delays. Specifying Crane Quality assures **Highest Quality** in every item . . . and dependable performance from every part of your piping system.

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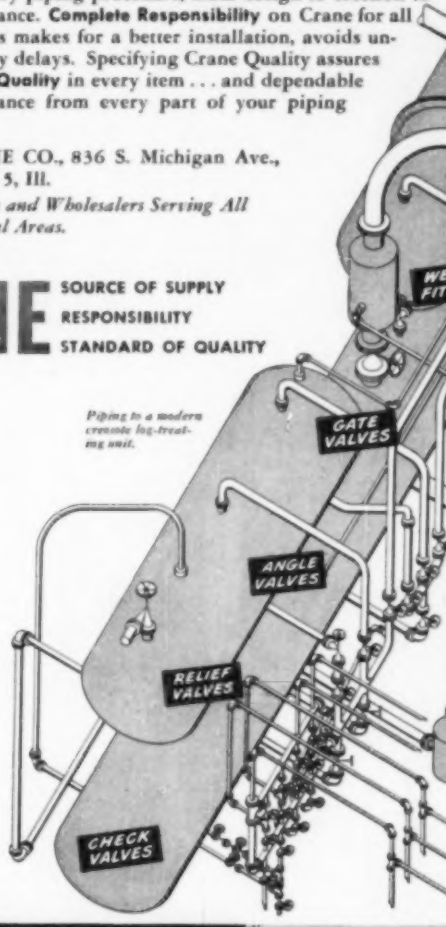

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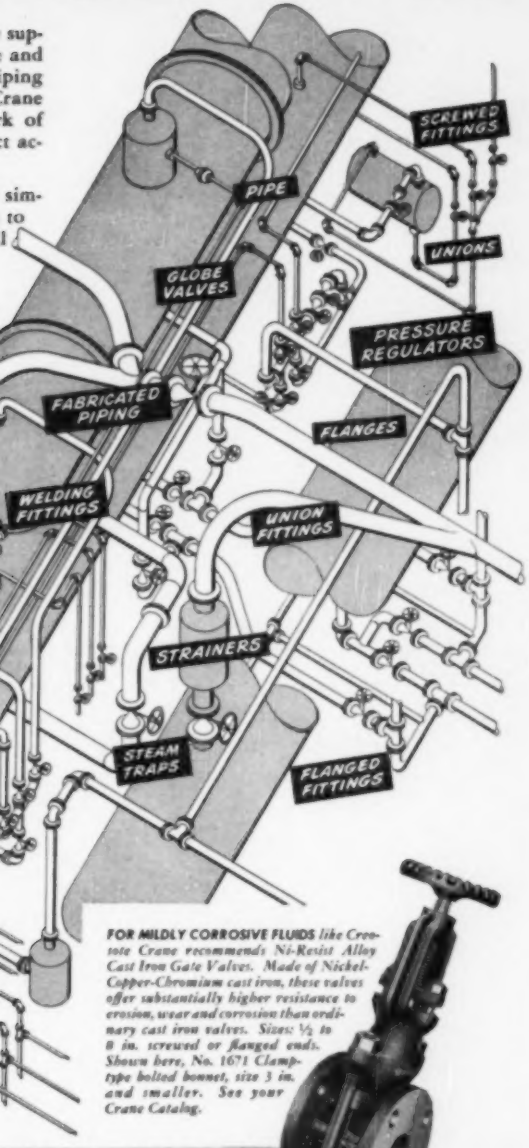
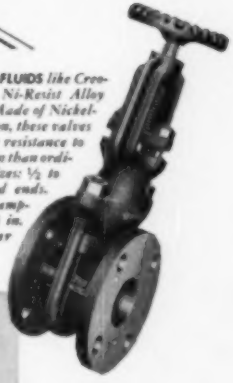


FOR MILDLY CORROSIVE FLUIDS *like Creosote Crane recommends Ni-Resist Alloy Cast Iron Gate Valves. Made of Nickel-Copper-Chromium cast iron, these valves offer substantially higher resistance to erosion, wear and corrosion than ordinary cast iron valves. Sizes: ½ to 8 in. screwed or flanged ends. Shown here, No. 1671 Clamp-type bolted bonnet, size 3 in. and smaller. See your Crane Catalog.*



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SUPERFINE MATERIALS

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Raymond Mechanical Air Separators find wide application in the chemical, food, and process industries and, in fact, wherever exacting fineness specifications must be met. In all of these industries you will find whizzer separation providing better quality, lower cost, more consistent finished materials.

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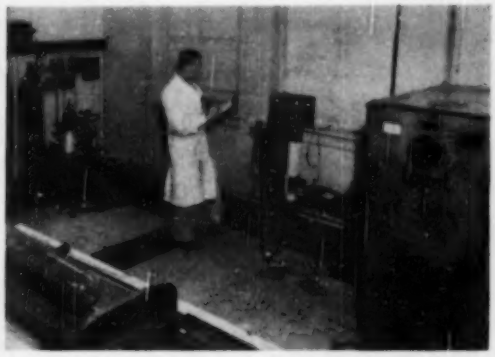

SCHOOLHOUSE that Foote Mineral bought for a laboratory. CLASSROOMS now contain researchers instead of children.

In the Little Red School House, a Fourth R

Add to the traditional three R's a fourth one—research, which Foote Mineral Co. is now carrying on in its new laboratories quartered in what was formerly a three-story brick school house in Berwyn, Pa. From outside, the building on a hillock along the Lincoln Highway near Paoli, Pa., still looks like all the other little brick school houses that are familiar landmarks across the country. But within, all is changed. Gone are the desks and blackboards, and in their place is the equipment for scientific research in the fields of refined ores, ceramic materials, electrode coatings, metals and alloys, and chemicals.

Faced with the problem of expanding its research facilities on short notice and within the limitations of a modest budget, Foote Mineral, a small but aggressive company that is 74 years young and in which the employees hold 50 percent of the stock, had to decide whether to build or to acquire a laboratory. The decision to purchase the former school house and turn it into a research center halved what Foote would have had to pay to put up its own new building. What's more, it took only three months to convert the school into a laboratory. Cost of the building was in five figures; value of the research equipment is in six.

Laboratories have been set up in the three-story building to carry on basic research, product development and engineering studies aimed at improvement of equipment design and process control. For ceramics, a section of the ground floor has been converted into a complete experimental unit in which all phases of theoretical and practical processing may be investigated. In this laboratory many significant projects in lithium chemistry are being carried on. Equipment is available for producing, testing and analyzing a wide range of ceramic products. The welding laboratory is another complete unit, in which electrode coatings are prepared from selected raw materials, are applied to welding rods by extrusion and are then tested by welding with a.c. or d.c. welding machines. Also on the ground floor is a well equipped machine shop for the production of special machinery, a minerals separation laboratory, a high-temperature furnace room and the crushing and grinding laboratory.

In addition to administrative offices, the metallurgical laboratory, engineering office and library are located on the first floor.

The top floor is given over to chemical research. The analytical, inorganic, physical and organic chemistry laboratories are there, together with glass blowing facilities. Major projects at present involve work on lithium compounds and zirconium.

Currently, Foote is pushing work on the production of titanium and zirconium metals by the iodide process. In this process, the metal oxide is converted to the tetrachloride, reduced with magnesium, then reacted with iodine under vacuum to form the tetraiodide of the metal, which is decomposed thermally to produce the sponge metal.

Likewise interesting is the investigation of the physical separation of mineral chemicals by distillation in Pyrex stills at temperatures around 700 deg. F. A 1-in. lagged column in the laboratory has 50 plates. For separating heavy metal compounds, Foote has also succeeded in constructing a 4-in. diameter glass column 25 ft. high. Vertical seals in the column were made by electrical sealing with 4,000 volts. The column operates at atmospheric pressure, has 50 plates and works at a reflux ratio of 30-to-1 or higher.

The staff of 35 at the Berwyn laboratory is headed by S. C. Ogburn, Jr., manager of research and development. He explains that Foote research breaks down into work done for the company itself, research jointly sponsored by Foote and other companies, and government-sponsored research, much of it in the atomic field.

Here's how Ogburn sizes up important Foote research now under way. Hottest two projects in chemical investigations are the search for a low-cost process for recovery of lithium from raw materials and the development of chemicals for the steel industry. In welding research,

(Continued)

improvement of electrode materials takes top place; and in ceramics, it's the development of low-temperature enamels and glazes. Most important work in metals and alloys is that on zirconium.

Bureau of Mines Sleuth in Texas to Track Acid Fumes

Acid fumes are causing widespread damage to property and discomfort to residents in Beaumont, Tex. At the request of the city officials the U. S. Bureau of Mines has sent a research engineer from Washington to make an investigation of the source of the trouble.

The fumes are believed to be coming from a chemical or oil plant in the area. They have been so prevalent lately that paint on houses has been destroyed, growing plants have been killed, and residents of certain sections of the city have left their homes when the fumes were at their worst.

The city is ready to institute legal action against the industry or persons responsible for the condition.

Pilot Plant Converts Coal To Gasoline for First Time

The coal hydrogenation demonstration plant at Louisiana, Mo., has just completed a continuous seven-week "break-in" run, converting coal tar oil and Wyoming coal to gasoline and other liquid fuels, the Bureau of Mines reports.

This is the first time that substantial quantities of oil have been made from tar oil and coal by hydrogenation in the U. S. The basic plant design proved to be sound and operable. With minor changes and adjustments, the plant will be a useful tool in the development and study of the processes for the conversion of coal to liquid fuel. It is contemplated that a wide variety of other coals will be tested later.

It is also noteworthy that this complex new plant completed its first run without serious interruptions, although the operators had only the limited high-pressure experience obtained during a vapor-phase operation last April. The extensive use of automatic controls typical in American industrial practice already has resulted in a comparatively much smaller operating force than was customary in the commercial synthetic fuels plants of Germany.

The demonstration plant was designed to produce 200-300 bbl. of liquid fuels daily from coal in two high-pressure steps, with pressure release and fractionation of the products between stages and at the end of the second step. In the first stage, called the liquid-phase hydrogenation, a paste of powdered coal and heavy oil is converted by the addition of hydrogen to mainly a synthetic crude oil. In the second step, or vapor-phase hydrogenation, this crude is hydrogenated further to produce high-grade synthetic gasoline and other fuel oil fractions. The plant utilizes American-made equipment throughout.

Last April the vapor-phase plant was operated to hydrogenate lignite coal tar distillate to gasoline and diesel fuel. However, the current liquid-phase run was the first during which coal tar and coal paste feed stocks were converted to synthetic oils. The operations were carried out at a pressure of 10,000 psi. and a temperature of 850 deg. F., producing gasoline, naphtha and vapor-phase charging stock.

After a thorough pressure-testing period, inert nitrogen and later hydrogen were circulated through the system to break-in moving machinery and test the instrumentation. The actual break-in operation started with the introduction of high-temperature coal tar oil. Charging stock and hydrogen first were circulated at full pressure and reduced temperatures, then the temperature was gradually raised to the reaction level. Tar oil hydrogenation was conducted at 850 deg. F., and after the available stock was used up, a paste containing 25 percent Wyoming bituminous coal was introduced. The run continued in a satisfactory manner and was terminated with a planned shutdown. Detailed operational and production data are not considered representative as the run was exploratory.

McGraw Award to Recognize Technical Education Leaders

The James H. McGraw Award in Technical Institute Education will be presented for the first time at the Seattle meeting of the American Society for Engineering Education in June on the University of Washington campus.

The award will consist of an annual prize of $500 in cash and an appropriately engraved certificate.

Sponsored by the McGraw-Hill Book Co. in memory of James H. McGraw, Sr., founder of the company, it is given for the purpose of recognizing and encouraging outstanding contributions to technical institute education in the United States.

Dean Thorndike Saville, dean of engineering, NYU, president of the American Society for Engineering Education, has appointed the following committee to select the recipient of the James H. McGraw Award for 1950: E. E. Booher, vice president, McGraw-Hill Book Co.; J. T. Faig, president, Ohio Mechanics Institute; C. J. Freund, dean, University of Detroit; K. L. Holderman, professor, Pennsylvania State College; L. V. Johnson, director, Southern Technical Institute; C. S. Jones, president, Academy of Aeronautics; and Dr. H. P. Rodes, University of California.

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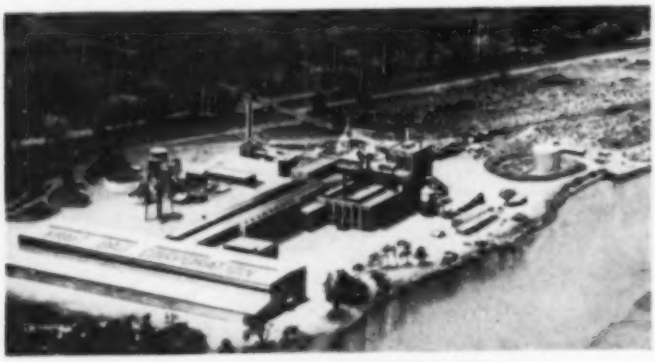
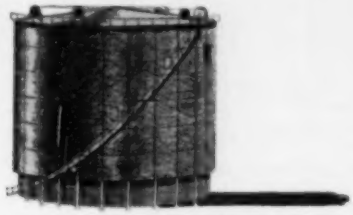


FROM SLASH PINE TO KRAFT PAPER SHIPPING SACKS

Air view of pulp and paper mill of St. Marys Kraft Corp. and the new conversion plant of Kraft Bag Corp. now in full operation at St. Marys, Ga. In foreground is new Kraft Bag factory, where heavy-duty multi-wall shipping sacks are produced. The mill at St. Marys converts slash pine into pulp, turns out kraft paper, and employs over 500. Kraft Bag Corp. and St. Marys Kraft Corp. are subsidiaries of Gilman Paper Co., Gilman, Vt.

Simplified Structure Revolutionizes Chemical Process Gas Storage



Wiggins Gasholder

by General American

Eliminates operating costs
Cuts maintenance needs

After 15 years under actual operation conditions, the principle of using an absolutely dry, frictionless seal for the storage of chemical process gases has proved itself! The heart of the new Wiggins Gasholder—its permanent, strong flexible seal—eliminates the need for constant inspection and maintenance of seals. No chance of explosive or toxic mixtures accumulating outside the storage space.

No water! No tar! No grease!

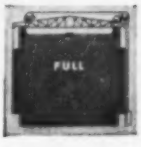
The seal has a core of woven asbestos glass coated on each side with synthetic rubber. It is gas-tight and impermeable. Because it has absolutely no liquid— nothing can evaporate and adulterate the gas. Nor can the seal itself evaporate—or freeze—or blow out.

No heavy or complex rigging

Since there is no water or other sealant liquid, the rollers, guides and delicate assemblies of ordinary gasholders are unnecessary. The Wiggins Gasholder foundation is comparatively light because there is no heavy water load to support.

Operates at any pressure up to 20" of water. Not affected by heat, cold, ice, snow, wind, rain. Capacities from 1,000 to 10,000,000 cu. ft. Delivers gas dry, pure, undiluted.

Note to Process Engineers



The principle of confining pressurized gas with a dry seal is not new. The Wiggins Dry Seal Gasholder, widely used in the petroleum industry has a 15-year record of success. Balloons and dirigibles have stored pressurized gases for many years. To find out exactly how this new adaptation of a tried and proved principle can give you better gas storage at lower cost over the years, write General American.

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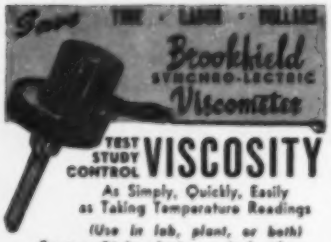

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Just a flick of the switch, then read the Brookfield dial, and you have your viscosity in centipoises. The whole operation, including cleaning up, usually takes *less than a minute.*

Suitable for extremely accurate work with a wide range of materials, both Newtonian and non-Newtonian, the Brookfield viscometer is portable and plugs in any A.C. outlet.

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who will act as chairman of the committee. Ex-officio members are Professor H. P. Adams, Oklahoma A. & M., chairman of ASEE's Technical Institute Division, and Dean Saville.

Although the committee will consider contributions of various types, such contributions usually will lie within the three categories of teaching, publication, or administration. It is not expected, of course, that nominees for the award shall be outstanding in all three categories.

Nomination forms may be obtained from any member of the committee or from Secretary A. B. Bronwell, Northwestern University, Evanston, Ill., of the American Society for Engineering Education. Nominations may be made by any person or persons other than members of the award committee, or employees of the McGraw-Hill Book or Publishing companies. Nominations for recipients of the award for 1950 must be mailed or delivered by March 15, 1950, to Chairman H. P. Rodes, James H. McGraw Award Committee, 130 Administration Building, University of California, Los Angeles 24, Calif.

CONVENTION CALENDAR

National Council for Stream Improvement, annual meeting, Waldorf-Astoria Hotel, New York, February 20-22.

American Institute of Chemical Engineers, regional meeting, Rice Hotel, Houston, February 26-March 1.

American Society for Testing Materials, committee week and spring meeting, William Penn Hotel, Pittsburgh, Pa., February 27-March 3.

Society of the Plastics Industry, Pacific Coast Section, annual conference, Hotel Del Coronado, San Diego, Calif., March 2-4.

Southern Paint & Varnish Production Club, Peabody Hotel, Memphis, Tenn., March 8-10.

Drug, Chemical & Allied Trades Section, New York Board of Trade, 24th annual dinner, Waldorf-Astoria Hotel, New York, March 9.

American Chemical Society, 117th national meeting (divided), Houston, March 26-30, Philadelphia, April 9-13, Detroit, April 16-20.

Western Petroleum Refiners Association, 38th annual meeting, Plaza Hotel, San Antonio, Tex., March 27-29.

American Drug Manufacturers Association, Boca Raton Club, Boca Raton, Fla., March 27-30.

National Plastics Exposition, Navy Pier, Chicago, March 28-31.

National Association of Corrosion Engineers, 6th annual conference, Jefferson Hotel, St. Louis, April 4-7.

National Production Exposition, Chicago Technical Societies Council, Stevens Hotel, Chicago, April 4-8.

American Institute of Chemical Engineers, Ohio and Pittsburgh Sections, symposium on development and marketing of chemical products, Case Institute of Technology, Cleveland, April 14.

Electrochemical Society, annual meeting, Hotel Statler, Cleveland, April 19-22.

Association of Consulting Chemists & Chemical Engineers, Hotel Shelbourne, New York, April 25.

American Wood Preservers Association, annual meeting, Rice Hotel, Houston, April 25-27.

American Oil Chemists' Society, spring meeting, Atlanta Biltmore Hotel, Atlanta, May 1-3.

High-Temperature Gas Maker Has Silicon Carbide Tubes

Engineers and executives of utility companies, who like to keep briefed on what's new in gas plants, recently journeyed to the Cleveland plant of Gas Machinery Co., where they got their first look-see at that company's revolutionary new gas-making machine.

Gas Machinery has had this new machine under development and test for three years. It differs from other continuous gas-making machines in that it uses silicon carbide tubes in the vertical furnace, which operates at 2,000 to 3,000 deg. F. Present machines can go no higher than 1,600 to 1,800 deg. F. in furnace temperature, due to their alloy steel tubes.

Its machine is the only one that can work at these high temperatures, says Gas Machinery. Reason: the company claims to hold the patent on the only practical method for making a tight joint in silicon carbide tubes.

Working at these higher temperatures, the new machine not only does a faster and more complete job of gasifying propane, butane, or gas oil, and even reforming natural gas, but it can also be adapted, preliminary tests indicate, to the production of hydrogen—although Gas Machinery as yet doesn't want to come right out and say the machine is a hydrogen producer.

Why has this machine whetted the interest of eastern utility engineers? If it can reform natural gas so that the product can be blended with more natural gas and used through present appliance burners, now set to use either water gas or coke-oven gas, the making of elaborate burner adjustments may be unnecessary.

(*Continued*)

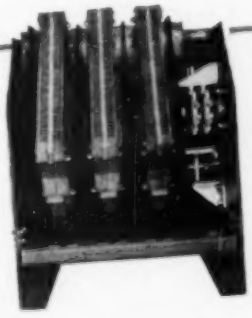
NOW! 5000V in 34"

NEW SMALLER G-E LIMITAMP AIR-BREAK CONTROLLER

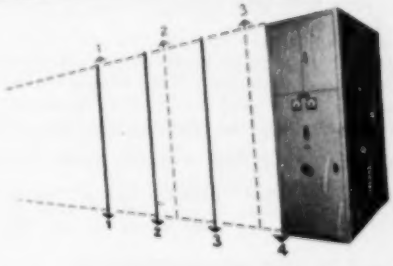
Only 34 inches wide—including enclosure—as contrasted to the previous 52, yet capable of controlling 840 more volts—that's modern design exemplified in this new high-voltage control for motors up to 1250 horsepower.

G-E developed EJ-2 fuses, providing quiet, fast-acting short-circuit protection are enclosed in a compartmented steel cabinet with the new, low-inertia air-break contactor. All the control you need for motors (even those on rapid duty cycle) is engineered, assembled, and tested in our factories to save you layout, installation, operation, and maintenance costs.

Write for more information in Bulletin GEA-5409. This includes descriptions of oil-immersed Limitamp control, reduced-voltage, two-speed, and reversing forms as well as the new full-voltage air-break controller. ***Apparatus Dept., General Electric Co., Schenectady 5, N. Y.***

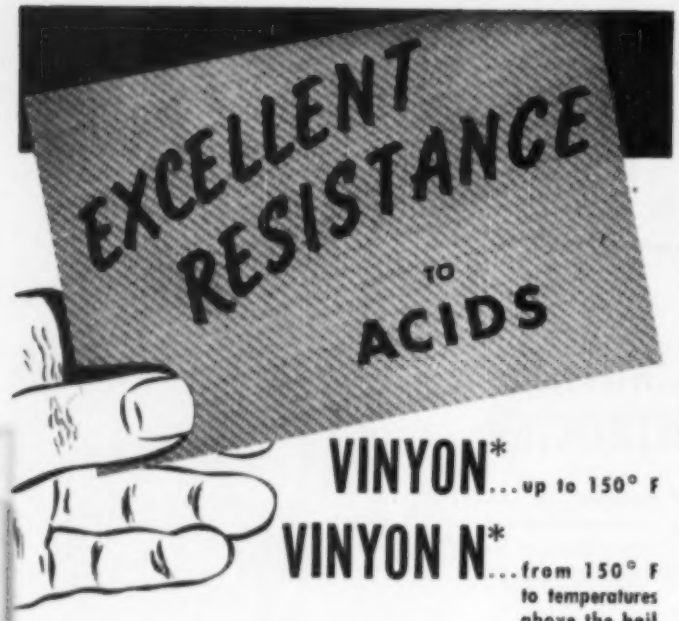


MORE VOLTAGE New air-break design increases the maximum rating from 4160 to 5000 volts.



LESS SPACE Width of cabinet is reduced, so now, four air-break controllers can occupy the space formerly taken by three.

GENERAL ELECTRIC



VINYON* ...up to 150° F

VINYON N* ...from 150° F to temperatures above the boil

Here are two groups of synthetic filter media that, in the temperature ranges noted, offer excellent resistance to the following common acids:

Sulphuric	Hydrofluoric
Hydrochloric	Nitric

They also exhibit a high degree of stability under most conditions where caustic solutions are encountered and are therefore excellent general purpose filter media.

We will weave NFM VINYON* and VINYON N* Filter Fabrics to your individual order in any desired width from 26" through 72" in quantities as low as 100 linear yards. Or, if you prefer, we will prepare your filter element covers for you with all sewing being done with VINYON* and VINYON N* Sewing Threads, of course.

In the more than forty years in which our organization has been engaged in weaving Industrial Filter Media, we have developed the "know how" necessary to produce Synthetic Fiber Filter Media which have superior filtering characteristics.

Don't Forget the Other NFM Types of Synthetic Filter Media:

Glass — Nylon — Saran — Orlon† (an Acrylic fiber)

All woven at our New Haven Mills

*TMC&CCC †T. M. R. I. duPont de Nemours & Company, Inc.

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Otherwise, the coming of natural gas to eastern cities, where it has hitherto been unavailable, is going to mean that millions of burners will have to be adjusted or replaced. The utility engineers are counting on this machine as a possible out to save them all that work. However, that's just one of the uses for the machine.

Here's how it works. The feed, introduced with steam, goes into the top of the vertical furnace and thence into the silicon carbide tubes. Thus near the top of the furnace the feed is preheated to the point where it is completely vaporized. From the preheat chamber the gases move downward through a catalyst that speeds the cracking reaction. Leaving the catalyst section, the gas passes out of the furnace through a water seal, for first cooling, then goes either to apparatus where it is mixed with other gas or to storage for subsequent distribution.

With its three tubes, the present experimental unit produces 24,000 cfh. of reformed gas, double the amount predicted. All that would be needed for greater capacity would be addition of tubes to the furnace. As yet, Gas Machinery has made no commercial installation of one of these units.

Big Petrochemical Venture Heralded by Plant Purchase

Pontiac Refining Corp. and Chicago Corp. are planning a $15 million petrochemical plant at Corpus Christi, Tex., where they have purchased the surplus war plant of Great Southern Corp. for $756,000.

Plans for production of 60 million pounds a year of ethylene glycol and 10 million pounds a year of ethylene oxide, in addition to a daily output of 5,000 bbl. of high-grade gasoline, have already gelled.

Preliminary planning has been started on units to produce ammonia, ammonium sulphate, butyl alcohol, butadiene, ethylene dichloride, polyethylene and an octane blending agent.

The plant originally produced aviation gasoline and synthetic rubber components until late 1947. It cost $8.5 million to build.

U. S. Firms Licensed to Make Bayer-Developed Chemicals

Geary Chemical Corp. and the Pittsburgh Coke & Chemical Co. will form a jointly owned subsidiary company to produce and market certain powerful new insecticides that have been

developed by the German chemical company Farbenfabriken Bayer.

These insecticides are to be made available for manufacture and distribution in this country under the terms of a contract between Bayer and the Geary Chemical Corp. and approved both by the American and British occupation authorities in Western Germany. The agreement with Bayer provides that Bayer will make available to Geary Chemical scientific and manufacturing discoveries, both current and future, in the agricultural chemical field as developed in the Bayer laboratories at Leverkusen and Elberfeld, Western Germany. The joint subsidiary to be formed by Pittsburgh Coke & Chemical and Geary Chemical will be licensed by the latter to manufacture and market certain of these developments.

Extension of Geary Chemical Corp.'s agreement with Bayer to cover other agricultural products such as fungicides, rodenticides and plant hormones, as well as insecticides, is provided for, as is the exchange of related technical and scientific information.

Products licensed to the new joint subsidiary of Pittsburgh Coke & Chemical Co. and Geary Chemical Corp. under the terms of the agreement between these two corporations will be marketed, initially at least, both by the Pittsburgh Agricultural Chemical Co. and the Geary Chemical Corp. itself.

William J. Haude and Robert J. Geary, both well known in the insecticide trade, are presidents, respectively, of the Pittsburgh Agricultural Chemical Co. and the Geary Chemical Corp.

More Cortisone for Research In 1950 Promised by Merck

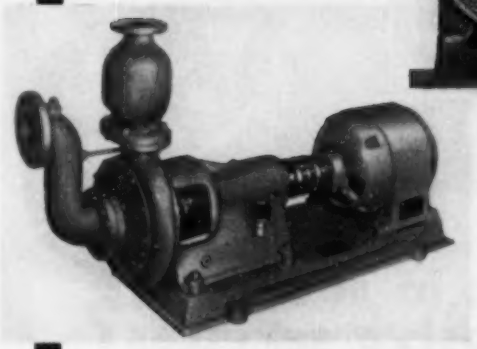
Merck & Co., Inc., now believes that its increased production of Cortisone in the first half of 1950 will be sufficient for it to supply teaching medical centers with limited quantities for research purposes.

Cortisone, which shows promise for relief of certain types of arthritis, acute rheumatic fever and certain other conditions, is expected to be available at a price 25 percent under what it formerly cost, as a result of savings achieved in production. The new institution or hospital price will be $150 per g., or $45 per cc. vial containing 300 mg.

The National Academy of Sciences Committee on Investigation of Cortisone terminated its activities December 31, 1949; thereafter Merck & Co., Inc., will allocate and distribute its

(Continued)

(Right) Lawrence Self-Priming Pump exhausting air during priming.



(Left) Lawrence Heavy Duty Self-Priming Chemical Pump.

LAWRENCE... SELF-PRIMING PUMPS

Patent Applied For

A new type for many exacting services

This is *the first real self-priming centrifugal pump ever invented:* — specifically, a pump that operates as a positive air pump during priming and then as a regular centrifugal pump. No valves of any kind are required. After priming, it operates — without recirculation of the liquid— at full efficiency.

Because dead spaces are eliminated and dearances are not close, the pump can be used for pumping liquids containing solids and abrasive matter in suspension. It can be furnished in all sizes for all classes of service: — water, slurry, sludge, acids and chemicals.

For further information and performance data, write for Bulletin 210-1.

LAWRENCE PUMPS

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MACHINE & PUMP CORPORATION

369 MARKET STREET, LAWRENCE, MASS.

Looking for a valve that *won't leak*

even in severe corrosive services?

Everyone who has experienced valve leakage either internal or external, knows what a headache it can be. For a wide variety of services involving corrosive and hard-to-handle fluids, Hills-McCanna Diaphragm Valves will put an end to those problems. These valves operate like a simple pinch clamp. A resilient rubber or synthetic diaphragm clamped between the bonnet and body is squeezed down against a wier by a compressor to shut off the flow. The resiliency of the diaphragm permits it to be molded to and around the edges of the weir to make a completely leaktight closure.

The diaphragm also serves as a seal to prevent external leakage and makes it impossible for the material handled to be contaminated or for the material to get into the working parts. You can't beat it for simplicity and effectiveness.

Hills-McCanna Diaphragm Valves are made in standard sizes ¾" through 14". Available with rubber, glass or specially lined bodies or with cast iron, alloy, Haveg or stone ware bodies. Choice of manual, remote or automatic controls. Write for data sheets. HILLS-McCANNA CO., 2341 W. Nelson St., Chicago 18, Illinois.

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saunders patent

diaphragm valves

Also manufacturers of — Proportioning Pumps

Force-Feed Lubricators • Magnesium Alloy Castings

production. First priority will be given to research projects for which Cortisone already has been supplied and some for which applications are still under consideration by the National Academy of Sciences Committee.

After these research demands are met, priority will be given to the requirements of teaching medical institutions in the United States and Canada and to appropriate research centers under government supervision. Preference will be given to those projects of greatest significance from the investigational viewpoint.

Cortisone has not yet been released by the Food & Drug Administration for general distribution and can be shipped only for purposes of investigation.

War Plant Gift to University For Texas Research Center

Title to the $7 million wartime magnesium plant at Austin, Tex., was recently given to the University of Texas by the War Assets Administration. The former magnesium plant will become a major research center. The University got it without having to pay its present appraised value of $1,475,936. That charge will be written off over 20 years by the public service it will render.

The university had leased the plant for the last three years and had converted many of its 26 permanent buildings into research laboratories.

Latex Processing Plant Boon To South's Paper Industry

First liquid rubber latex processing and distributing plant in the South, that of Southern Latex Corp. in Austell, Ga., is just getting into full operation.

This new enterprise, located on the main lines of the Southern Railway about 15 miles northwest of Atlanta, will be headed by 47 year old Doug C. Cochran, former rubber products manager of the Flintkote Co. Prior to joining the Flintkote organization in 1936, Cochran was for many years associated with the United States Rubber Co., and subsequently with Lea Fabrics, Inc., of Newark, N. J.

Latex is widely used throughout the South as a coating, binder, laminant, saturant and adhesive by the textile, paper and automotive industries. To users, the installation of bulk handling facilities and a processing plant so centrally located will mean lower transportation costs, faster deliveries, more prompt and effective technical service, and more frequent

selling contacts, it is pointed out. Latex compounds specifically designed for southern industries will also result.

"The South has long been a major source of textiles and paper. Currently, the fabrication, conversion, assembly and application of these primary flexible materials is assuming major importance," Cochran states. He adds, "In these operations latex is required, and it shall be the purpose of the Southern Latex Corp. to provide service in the South equal to that available in other manufacturing areas."

Processed latex is now being shipped in from the Boston, New York, Philadelphia and Akron districts. The Austell latex plant will permit year-round deliveries in either large or small quantities. And these latex shipments will be protected from freezing.

NEW SO_3 PLANT
This 25-ton-a-day liquid SO_3 plant being put up by Tennessee Copper Co. at Copperhill, Tenn., will be ready for operation early this year.

Ohio Vinyl Plant Purchased From Martin by U. S. Rubber

United States Rubber Co. has purchased the Glenn L. Martin Co.'s chemical division, including the vinyl resin plant at Painesville, Ohio, in a sale that reportedly involved between $6 million and $7 million.

Besides the model postwar plant at Painesville, U. S. Rubber gets laboratory equipment in Baltimore, Md., where Glenn Martin has its headquarters, and patents, together with the trade name Marvinol.

U. S. Rubber reports that the business is to become a part of its chemical division, which has its main offices in Naugatuck, Conn.

Both the Glenn Martin management and the 200 employees at Paines-

(Continued)

THE *Versatile* VERSENES*...
. . . can make your products (and processes) better!

VERSENE Fe-3* . . .

The powerful new sequestrant — does more than soften water without precipitation. It actually inactivates troublesome trivalent iron as well as calcium, magnesium and other metallic salts. Until VERSENE Fe-3 was developed, there was no really satisfactory sequestering or chelating agent for ferric iron. At pH7 10 cc of Versene Fe-3 sequesters at least 167 mg. of Fe_3 plus 158 mg. of calcium. Above pH9 it is most effective on alkaline earth ions.

VERSENE* (REGULAR)

Is the tetra sodium salt of Ethylene diamine tetra acetic acid and is available in solution or powdered form. Extremely versatile, economical and efficient, it may be used to do a variety of things such as:

- **Softening Water Without Precipitation**
- **Removing Hard Water Deposits And Precipitates**
- **Dissolving Grease And Food Deposits**
- **Clarifying Liquid Soap Solutions**
- **Preventing Oxidation Of Fats, Oils, Soaps, Fatty Acids, Organic Materials**
- **Stopping Reactions Catalyzed By Metallic Ions**
- **Aiding In Purification Of Materials**
- **Separating Metals From Each Other**
- **Reducing Activity Of Metal Ions**

VERSENE* is a pale, clear, straw-colored aqueous solution with *total solids* approximating 34%. It has an approximate *density* of 1.2 and an approximate pH of 11.75 in a 1% solution. VERSENE* is also available in crystalline form as a dry white powder. Send for Technical Bulletin No. 1. Ask for Fe-3 Data Sheet. Samples on request.

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WEST COAST AGENT: Griffin Chemical Co., San Francisco—Los Angeles Warehouse Stocks

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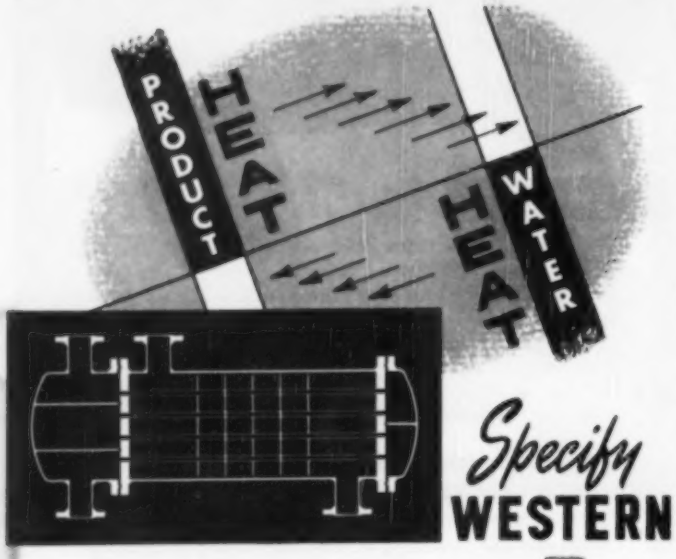
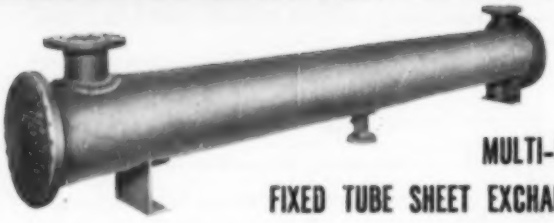


Specify WESTERN



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FIXED TUBE SHEET EXCHANGER

Western Heat Transfer Equipment plays an important role in general chemical processing. Close attention to detail and specification, from design to installation, is the prime consideration in the manufacture of all Western equipment. Chemical processing plants, refineries and pipe lines throughout the world depend on Western's economical, uninterrupted service.

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ville have been transferred to U. S. Rubber's payroll. The newly acquired Ohio plant has a monthly payroll of around $50,000. Also affected by the changeover are 65 Martin research, sales and technical-service people in Baltimore. They are being shifted to Naugatuck.

The Painesville plant, built in 1947 at a cost of $6 million, consists of nine buildings and is the third largest vinyl plastics plant in the country.

Vinyl plastics have come into widespread use since World War II. Consumption in the United States at present is estimated in excess of 200 million pounds a year.

In selling its chemical division, Martin, which henceforth will concentrate on aircraft, takes its final step in quitting the chemical business.

Fluorosilicate Key Compound In New Synthetic Mica

Mica, a critical material in the manufacture of electrical and electronics equipment, has been successfully synthesized by scientists of the National Bureau of Standards, Secretary of Commerce Charles Sawyer announces.

The synthetic mica, crystallized successfully by Herbert Insley, Alvin Van Valkenburg and Robert Pike, all of the Bureau, has essentially the same properties as natural mica but is superior to the natural substance in its ability to withstand high temperatures.

"This discovery is of immense importance to the United States, which is the world's largest consumer of mica but which produces only enough to meet a fraction of its own requirements," according to Secretary Sawyer. "During 1948 the U. S. imported over 10,000 tons of high grade mica valued at more than $15 million. In the same period, domestic production of high grade mica totalled only 135 tons with a value of less than $50,000. Synthetic mica production may make it possible for the United States to meet its own demands for this critical material."

The work on synthetic mica is part of a broad program of research on fluorine-type artificial minerals carried on by the National Bureau of Standards under the sponsorship of the Office of Naval Research. The synthetic mica phase of the bureau's program, sponsored and coordinated by the Office of Naval Research, has been carried out in cooperation with the U. S. Bureau of Mines and the Colorado School of Mines.

The synthetic mica has four ingredients. Three of these are common materials sometimes used in mak-

ing glass: quartz, magnesite and bauxite. The fourth—a fluorosilicate compound—is added because it acts as a crystallizing agent. It is the presence of this fourth ingredient that makes the synthetic material superior to natural mica in resistance to breakdown in high-temperature applications.

In its natural state mica is the result of a long process involving extremely high pressures and temperatures. For safety and convenience, such high pressures are undesirable in laboratory or production processes. The bureau's goal was, accordingly, to synthesize mica satisfactorily at normal atmospheric pressure. Here fluorine proved to be a successful crystallizing agent. Although natural fluorine is poisonous gas, difficult to control, a group of synthetic fluorine compounds—the fluorosilicates—provided a convenient and safe way of introducing fluorine into mica synthesis.

In producing synthetic mica, the four powdered ingredients are placed in a platinum-lined crucible and melted in an electric furnace at a temperature of nearly 2,500 deg. F. As the furnace cools, mica crystals grow from a tiny seed at the bottom of the crucible. Ordinarily, the individual mica crystals form groups oriented in many different directions. For mass production, however, the mica crystals should be formed in parallel sheets. The key to this seems to be precision control of temperature differences within the crucible.

U. S. Gypsum's Expansion In Texas to Cost $1 Million

Construction has commenced on an expansion and improvement program for the United States Gypsum Co.'s plant at Sweetwater, Tex. It will cost over $1 million. The Sweetwater plant, largest of its kind in the Southwest, annually produces $12 million worth of gypsum wallboard, gypsum lath and sheathing.

The program includes a major addition to the plant itself, installation of new equipment and inauguration of improved production methods. These improvements are expected to be completed next fall.

RFC Loan Aids Modernizing At Brine Plant in Michigan

Michigan Chemical Corp., manufacturer of industrial, pharmaceutical and agricultural chemicals, is undertaking a program of modernization and expansion at its St. Louis, Mich., plant.

This program is being financed

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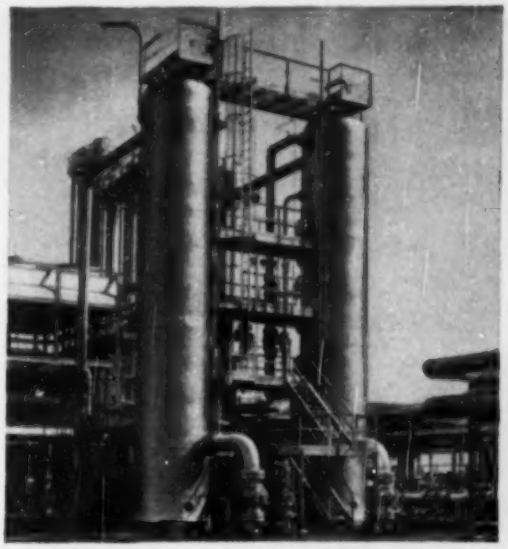

Panoma has found

FLORITE

"very satisfactory"

The Panoma Plant of the Panoma Corporation, near Hooker, Okla., uses Florite in its dehydration towers, which were handling daily at last report, 85 million standard cubic feet of natural gas at a pressure of 675 pounds. They were designed to handle 140 million standard cubic feet at 750 pounds pressure. Gas dehydration is required in preparation for pipeline transmission.

This large modern plant has been in use since November, 1948, and, according to a report of the Panoma management at the end of a year, "has operated very satisfactorily."

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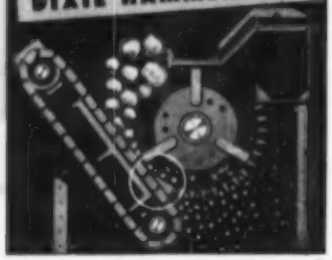

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partly by a loan of $1,100,000 from the Reconstruction Finance Corp. This loan will be employed to modernize the facilities for manufacturing heavy industrial chemicals such as salt and calcium-magnesium chloride and will also permit the retirement of debentures and an increase in working capital.

The plans call for the installation of new salt evaporators, as well as related equipment for the production and processing of Michigan brines, and also for equipment to package and warehouse the finished products.

When the plant is completed the Michigan Salt Co. (wholly owned subsidiary of Michigan Chemical) will be selling products from one of the most modern plants in the industry.

New evaporators and other improvements in the calcium-magnesium chloride plant will make this also a highly efficient and low-cost operation.

Another part of the program is an intensive study of other plant operations. Investigations of process and product improvements in DDT, magnesia, bromine and other chemicals have been under way for some time and are continuing. Some changes have been made and others are contemplated. Objective of these changes is to make operations in the manufacture of the company's products more efficient to meet competition.

Pennsalt Adds New Unit to Its Calvert City Plant

A new plant for the continuous process manufacture of its Erusto Laundry Sours is now being constructed by the Pennsylvania Salt Manufacturing Co. as the first addition to its $2 million plant recently put in operation at Calvert City, Ky.

This addition was contemplated in the original plans for the Calvert City operation. It is the first in a series, now under consideration, designed to use some of the hydrofluoric acid production as a basic material in the manufacture of Pennsalt's line of fluorine chemicals.

The new unit will consist of a modern, continuous, automatic process. It will have a capacity approximately double Pennsalt's existing facilities for the manufacture of these products.

The processing unit is to be constructed entirely of alloy steel and rubber-lined equipment with special controls to assure a product of high quality.

The building will be of conventional brick, steel and transite construction, closely integrated with present plant structures. Both the building and layout of production equipment were designed by the central engineering department of Pennsalt. Total estimated cost of the project is $250,000.

The plant is scheduled to be in operation by June 1, 1950.

BRIEFS . . .

Sherwood Refining Co., Englewood, N. J., has acquired the Gretna, La., plants of Seaboard Refinery Co. for the production of white mineral oil, Petrolatum and petroleum sulphonates. The purchase marks Sherwood's entry into the South as a manufacturer. Founded in 1920 with a small plant in Brooklyn, N. Y., the company, which has its main offices in Englewood, operates other refineries in Warren and Karns City, Pa.

Freeport Sulphur Co. has formed a division to conduct oil and gas exploration and development. With offices in Houston, Tex., the new division will be headed by H. C. Petersen, for the past six years superintendent of land and exploration for Freeport.

Wyandotte Dolomite, Inc., new Findlay, Ohio, corporation, has just opened a quarry near Carey, Ohio, and will build a crushing, screening and drying plant nearby, with rail shipping facilities to be serviced by the New York Central.

Stauffer Chemical Co. has let contracts for the first of the buildings, a warehouse, at its new Houston, Tex., insecticide plant. Plans for the other buildings are now being prepared.

Readers' Views and Comments

Tonnage Oxygen

To the Editor:

Sir:—The article in the December 1949 issue on "Tonnage Oxygen Today" by P. W. Sherwood was an excellent review of the present status of the manufacture and uses of oxygen on a large scale. There was, however, one statement which I thought was a little misleading and should be corrected: "the lower-grade tonnage oxygen can be manufactured at a cost of only about one-sixth to one-fourth the price of the purer product."

This might lead one to think that

(Continued)

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Y VALVE

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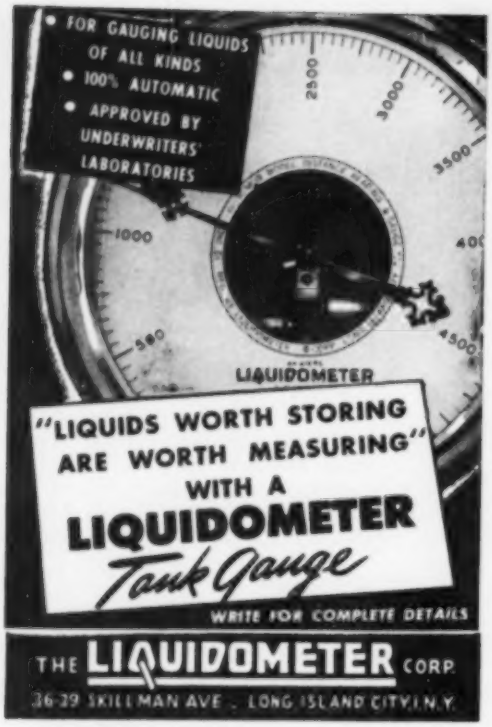
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the whole difference in the cost of tonnage oxygen and oxygen made by so-called "classical" methods is due to lowering the purity from 99.0+ to 95-98 percent. This is far from the truth. Processes such as the Kellogg or the Elliott that Mr. Sherwood refers to in connection with tonnage oxygen can make 99.0+ oxygen too. The cost will be somewhat greater than for 95-98 percent due to the fact that the rectifying column must be larger and will require more reflux but the increase might be of the order of 20-30 percent and not four to six fold.

The great difference that Mr. Sherwood refers to is due not so much to a lowering of the purity but to the great increase in the size of the plants and the accompanying improvements in heat exchangers, expanders, compressors and mechanical methods of air purification, which made the large plants economically feasible.

BARNETT F. DODGE
Yale University
New Haven, Conn.

We're Taken to Task . . .

To the Editor:

Sir:—We were quite disturbed to read on page 74 of the December issue of *Chemical Engineering* the article entitled "Butyl Rubber Reefs Its Sails." The first paragraph of this article mentions a release by Mr. Cecil Morgan, vice president in charge of our Baton Rouge operations, announcing the shutdown of one of the three government-owned butyl units operated by us at our Baton Rouge refinery. This section correctly states that the shutdown resulted from a general reduction in rubber requirements.

However, it might be inferred that the rest of the article is a part of the same Esso Standard Oil news release. Actually, it is not part of the release and, in addition, the statements made could not be adduced by any facts at our command. Our belief is that the rubber industry as well as this company are encouraging as best we can the use of butyl tubes and any other interpretation of our policy is most unfortunate.

Figures have been published which show that in the early part of 1949, production in the tire industry exceeded the normal demand for new equipment and for replacements, with the result that in the last quarter of 1949 the rubber industry in general reduced its takings of all types of new rubber. However, 52,700 long tons of butyl rubber was produced in the United States in 1948 and approximately 52,000 was produced in 1949.

At the present time production is scheduled at an annual rate of about 50,000 long tons.

We are reasonably confident there will be consumed at least the same proportion of butyl in inner tubes in 1950 as in 1949 providing there is no substantial change in the relative prices of natural and butyl rubber.

STANLEY C. HOPE

President
Esso Standard Oil Co.
New York, N. Y.

. . . Twice

To the Editor:

Sir:—The article in the December issue of *Chemical Engineering*, "Butyl Rubber Reefs Its Sails," is a gross misrepresentation of the facts.

The suggestion that sales might be temporarily increased through the offering of an inferior product is insincere. The record of tire manufacturers and their eminent position in the transportation industry contradicts such an improper statement. The United States Rubber Co. would not countenance such tactics and we are equally certain that no other manufacturer of tires and tubes would seriously consider such an unsound scheme.

One of the outstanding scientific developments of this century is the modern automobile tire and tube. The rubber industry is proud of this achievement. Millions of dollars have been spent to give tires and tubes more mileage at less cost to the motorist. We are still spending large sums to improve these products. The United States Rubber Co. has played a major part in bringing butyl tubes to their present state of perfection. It believes that butyl will continue to be the preferred material for inner tubes. We are still at work in the laboratories to make it more perfect.

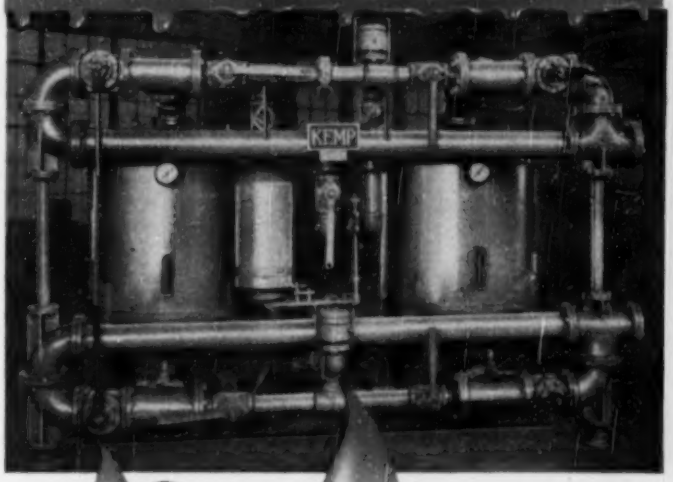
Your accusation against the rubber industry is particularly unfortunate because of the likelihood that it may be used later to discredit the capitalistic system by slander.

You were correct in reporting that tube sales in 1949 were lower than in 1948, but the decline was not caused by the reasons you cite. Sales dropped some in 1949 because of the general recession in business and also because motorists had bought tubes and tires in unusually large quantities in the previous year. Consumption of butyl is expected to continue in 1950 at about the rate of 1948 and 1949.

G. M. TISDALE

Vice President
United States Rubber Co.
New York —*End*

STOP MOISTURE DAMAGE



Kemp Dynamic Dryers solve moisture control problems—combine dependable operation with low operating cost!

YES, no two ways about it, Kemp Dynamic Dryers *control moisture* at rock bottom prices. For example, a Kemp unit drying gas may cost you as little as ¼ *cent per mcf!* And that ¼ of a cent includes *all* labor and utility costs—plus the cost of the equipment amortized over a five-year period! But low operation cost is just part of the Kemp story.

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Kemp Dynamic Dryers are flexible . . . offer *manual, semi-automatic* or *automatic* operation. Desiccant is especially selected and compounded for the particular duty. Units are available for drying *air, gases* or *liquids* . . . for controlling humidity in large or small areas. Choose gas, electric or steam regeneration . . . with or without cooling units.

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Production lagged in an asphalt plant. The two 2,000-gallon heat-transfer absorbers were losing efficiency because of an unstable circulating oil. At high temperatures it broke down and formed deposits which insulated the walls of jackets and pipes, retarding heat flow. Frequent oil changes, with 3-day shutdowns, would have been necessary to maintain efficiency.

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Men, Machines and Methods

ROGER WILLIAMS, Jr., Associate Editor

How and Why to Hold Plant Openhouses, A Real Method of Improving Community Relations—Part II

NOTE—*This is the second, and concluding, part of the plant visitation manual prepared by the Du Pont company public relations department for the guidance of Du Pont plant managers.*—EDITOR.

THE METHOD in which visitors are received and shown about a plant varies so much that literally no two are alike. A study of several reveals, however, that the elements, or framework, of the most successful programs are fairly constant, comprising four distinct phases:

1. *Greeting*—Visitors reach the plant gates at a pre-arranged time and are escorted to a meeting room where they are met by the employee acting as host. They are welcomed formally, are given a little general information about the plant and the company, and are told something about what they may expect to see. (This initial contact is one of the most important links in the chain of events. Receptions of visitors must be carefully planned.)

2. *Tour*—The plant tour commences along a prescribed route. If the group is large, it is broken into smaller units of from four to eight persons, each accompanied by a competent escort.

3. *Rest or "Break" Period*—If the visit is very long, it is desirable to provide a rest period. Frequently the time of the tour includes the noonday mealtime, and lunch is usually served the visitors, who follow the same routine as employees. At other plants, where tours are confined to an afternoon period, soft drinks are provided during the "break."

4. *Discussion*—Visitors return to the conference room for discussion of what has been seen, giving them an opportunity for questions. Sometimes a moving picture is shown, or they are presented with literature or product souvenirs.

Notice that in each of the four phases, opportunity is given the guests to learn more than what they merely see. Discussion and conversation are facilitated in all parts of the program. It is emphasized, therefore, that despite the many variations to the above schedule, something similar in spirit to this one is considered desirable to achieve maximum effectiveness.

A visitation program, like any other plant project, is only as good as its organization and administration. What it takes to operate a production program and how certain phases are handled are discussed in the following paragraphs. Few schedules contain all the organizational elements discussed here, however.

1. *Program Director or Supervisor.*—Someone is required to make over-all plans and supervise administration. He should be an individual whose supervisory stature is in or near the top levels of management, since the visitation program is a subject of much importance to the plant manager, himself, and his counsel should be readily available. The director or supervisor should be thoroughly familiar and in sympathy with the basic objectives of the visitation program and should learn as much as possible about the experience obtained in other plants.

2. *Host*—The host has direct supervision over the program, as distinguished from the indirect supervision of the program director. The host is the "official greeter"; he conducts discussions, arranges for plant speakers, if any, trains the guides or escorts, etc. (This responsibilty is sometimes combined with that of the program director.)

3. *Guides or Escorts*—Persons selected to accompany visitors on plant tours have an assignment whose importance is frequently underestimated. The "running commentary" which the escort or guide furnishes the group he is showing about the plant, affords one of the greatest opportunities for telling industry's story effectively and impressively. A guide's answer to a guest's question or his general demeanor might very well spell the difference between a good impression and a bad one. It is a serious assignment, and personnel not otherwise entrusted to heavy responsibilities cannot be expected to carry out this one. It is better, then, to choose the guides from supervisory ranks, with a consideration of the individual's ability to understand and appreciate the significance of the plant visits. (Another advantage of having exempt employees as guides is that it eliminates difficulties which arise on plants where prescribed job duties for wage-roll employees are strictly interpreted.)

(On small plants, where visits are occasional and confined to very small groups, it is not unusual for one person, even the plant manager himself, to fill all three functions listed above—planning the visit, leading the discussions and escorting the guests. But this is exceptional. It is highly desirable for the plant manager to have some part in the program—giving a short talk, answering a few questions—but it is not mandatory.)

4. *Pamphlets and Literature*—Several plants present guests with pamphlets, specially prepared for the visitation program. Such folders include information about the company, its industrial relations plans and policies, something about the plant's process and product. If used, these folders should emphasize that the plant is an integral part of the community, that prosperity for the community is reflected in the plant and vice-versa—one of the strongest points which a plant has to make in the visitation program. In attempting to relate information about the over-all company, the pamphlet should avoid stressing absentee ownership and should minimize the extent of outside influence on the plant. *Preparation of such literature for distribution to visitors is a highly skilled process, and special talent should be sought before one is printed.*

5. *Product Souvenirs*—If the plant manufactures a consumer product, it frequently is desirable to present visitors with a "sample." Sometimes this is highly impractical because of the nature of the product. Still other plants, even where the finished product does not go directly to the public, give some piece of it for guests to take home. Chief advantages of giving a

(*Continued*)

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product souvenir seem to lie in the slight advertising value plus a token of remembrance. While these are worthwhile objectives, always remember to keep the principal emphasis on people, not products.

6. *Meals or Refreshments*—Whether to serve meals and/or refreshments and whether to charge for them need not necessarily be an inflexible policy. Sometimes a free meal is indicated; at other times, no meal at all, or serving one and charging for it, is desirable. Important point to consider there is that guests do not get the impression that the food they are receiving is different in any way from the day-to-day bill of fare.

7. *Exhibits, Placards, etc*—Aside from the "flow chart" discussed later, exhibits of various natures are sometimes used with good effect. Certainly, any general exhibits maintained for employees should be shown also to visitors, such as a safety display, uses of the product, how it is converted into the finished product, etc. Beyond that, on some occasion of unusual significance, placards have been prepared for display near unusual machines, telling the physical specifications, cost, and other pertinent information.

8. *Moving Pictures, Slide Films*—This technique has been employed with considerable success at plants where films or slides are available on the product itself, its use, manufacture, etc. If it is a silent film, adequate commentary should be provided by the discussion leader. Chief consideration here is that the film must always have a worthwhile story to tell or point to get across. An industrial film which can be connected only remotely to the plant seems to have little justification for being used.

WHICH AREAS TO VISIT

It is sometimes neither practical nor desirable for guests to visit all operations areas—production, shipping, receiving, administration, etc. Further, there is a growing belief that a more or less "token" view of the actual process will prove adequate. This is of no concern, of course, in plants where production is largely carried out in a single "line" which does not involve a lengthy walking distance. All things being equal, a tour of this "line" would be practical. But when operations are scattered over a very wide area, the visitors' proposed route should be studied with a view toward such considerations as these:

1. *Walking Time Involved*—Average visitors will be exhausted by an extensive walking tour. Two hours of steady walking, for instance, is too much. One hour is better. Anything over that should be broken by "rest stops."

2. *Safety Precautions*—Obviously, the tour should avoid any area where safety hazards cannot be sufficiently controlled. An area may be entirely safe for an employee, for instance, who is familiar with the danger points, but strangers would require special attention. (See Legal Implications and Safety Factors below.)

3. *Spectacular Appearance*—Many plants have certain processes and equipment which are distinctive in appearance, either because of the dexterity required to operate the machine, the unique construction of the equipment, the peculiar way the machines work, etc. Certainly, visitors should be given a "good show" in keeping with dignity and accuracy of spirit.

4. *Representative Process*—If all areas are not to be visited, guests should have the opportunity to witness at least one operation which is representative of the over-all manufacturing process. Expressed another way, just because an area is safe or spectacular in appearance is not sufficient reason for it alone to be visited, unless it is also representative of the whole process.

DISCUSSION TECHNIQUE

The oral presentation of information is important because it is the thread which ties together the various phases of the program. More than that, however, conversation and discussion will do more than anything else in achieving the fundamental objectives of the visitation program. The visit and the actual tour of the plant are, after all, largely thought-stimulants which arouse interest and make visitors receptive to ideas which may be presented by word-of-mouth.

Promoting this technique is a responsibility of the host and the guide, and their jobs will be greatly facilitated if discussion subjects are planned and probable questions anticipated. What the host (discussion leader) has to say may be both formal and informal in nature. The guide's comment may also be planned, using things to be seen on the visit as reason for a specific discussion.

The entire visit should be arranged with this original premise in mind: simply showing off the process is not enough; it is necessary also to relate what is being seen to the lives of the people seeing it. A review of the topics suggested under the heading, "Objectives," will show the variety of subject-matter which readily can be associated with what the visitors see—and the opportunity for discussion should come during all phases of the

visit, the greeting period, the tour, the lunch, or the last general meeting.

In discussing any subjects, even the simplest of technical terms can be confusing to non-technical groups. There is a big difference between "talking down" to someone and speaking understandably. Consider this example, which might be the casual comment of the guide or host explaining a certain machine and pointing out the consequences of technological improvement:

"This hydraulic pump had a rated capacity of 20 GPM's. Recent technological improvements, however, have raised actual output to 25 GPM's. Lower unit production costs brought about a lower selling price, which resulted in more widespread distribution. Increased sales revenue yielded a greater return on the original investment, and stockholder, customer, and employee were benefited."

While the motive behind these comments is entirely good, much of the impact is lost in words and phrases like "hydraulic pump," "GPM's," "technological improvement," "unit production," etc. An improvement might be:

"When this pump was first built, it would put out about 20 gallons of (product) per minute. Research people got busy and improved the machine to the point that its output is now 25 gallons, which is an increase in efficiency of 20 percent. The machine itself now produces more, and the men operating it are credited with more so-called *unit* production. This is one example of what we call a technological improvement. What are the results in this case? If the machine produces more, costs per gallon are less. Lower production costs enable the company to sell the product for less, and in the American distribution system, more goods are sold when the price is lowered and the quality maintained. Increased sales mean more financial return, which is passed on to the stockholder in the form of dividends, to the employee in wages, and to the business itself for more research, or for expansion and improvement." (Note: Guides are not asked to memorize this passage. It is given here as an example of what could be used.)

Generally speaking, oral information is presented somewhat formally during the conference periods, less formally during the tour.

1. *The Conference*—This is an occasion where the subject-matter is more or less planned beforehand and delivered from notes or a prepared manuscript. The speaker or chairman (there may be more than one) has been assigned specific topics for discussion.

(Continued)

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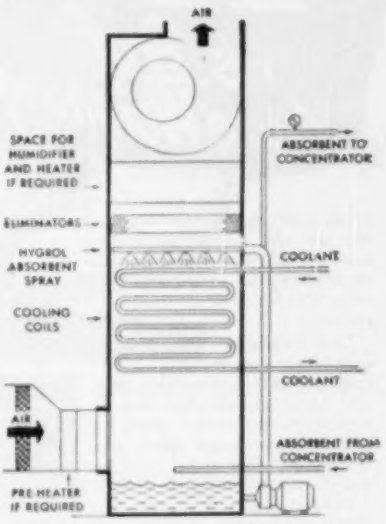
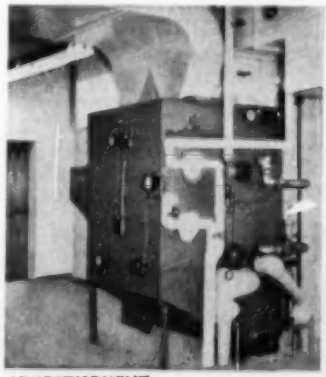


NIAGARA CONTROLLED HUMIDITY METHOD — FLOW DIAGRAM

● The Niagara "Controlled Humidity Method" is a new system of air conditioning giving complete control of temperature and relative humidity, holding constant conditions or varying them at the will of the user. Especially, it provides dry air at normal atmospheric temperatures with little or no refrigeration required. A condition of 15 grains of moisture per pound of air at 85 deg. F. dry bulb temperature has been produced without refrigeration.

The apparatus is enclosed in a casing thru which the air is drawn by fans. The air is filtered and then enters a chamber where it is dehumidified in passing thru a spray of "Hygrol" Liquid (a hygienic hygroscopic chemical that absorbs the air-borne moisture and contains no salts or solids to precipitate). In the same chamber are located cooling coils which remove the latent heat of evaporation and also sensible heat as required.

The absorbent liquid spray falls into a tank at the base, where it is piped to a concentrator, removing moisture taken from the air. The re-concentrated liquid returns to the system. This process is continuous, and the apparatus operates at full capacity at all times.



The same equipment may be used to provide winter air conditioning when required, by installing a tempering coil at the outdoor intake, an humidifier, and a reheat coil above the eliminators.

This equipment is manufactured in a range of sizes providing from 1000 to 20,000 CFM of conditioned air from a single unit, and mutiple unit installations are practical. It is expected that, by reducing the need for refrigeration, the cost of air conditioning will be reduced by this method. Applications generally are in a temperature range from 35 deg. F. upward. Below the freezing temperature of water, the Niagara "No-Frost" method is applicable.

The equipment is protected by U. S. and foreign patents. Installations have been made in food and chemical process industries, in packaging hygroscopic products, for preventing condensation of moisture on metals and other products in storage, in air conditioning for laboratory control and for human comfort.

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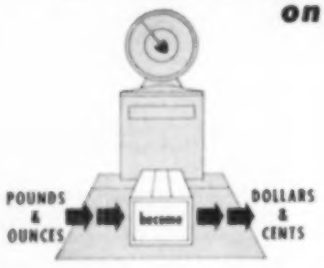

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M M & M, cont. . .

If it is the first session, comments usually include an official greeting, a "preview" of what is to be seen, and general discussion of the community, the plant, and the company.

In the "preview," many plants illustrate the discussion by use of a "flow chart," a diagrammed layout of the production process. It can be of considerable aid if skillfully prepared, properly displayed, and adequately explained.

When the tours include still another session, it is usually a meeting. Sometimes it is a period of questions and answers, an occasion for another prepared speech (some plants review their history of labor relations), or a time for movies or slide films. Souvenirs may be presented. If a visitors' pamphlet has been prepared, it is frequently considered wise not to present it until the guests are ready to leave.

2. *During the Tour*—As mentioned previously, the persons who escort visitors about the plant have a large measure of responsibility. They "set the tone." Their ability to answer informally but effectively the routine questions which arise during the tour is a good gage of the benefits to be expected from the visitation program.

Guides should be thoroughly conversant with the process itself, and should know what, if any, of the process is considered a "trade secret" not to be emphasized. Their knowledge should go further than that, however, so they can discuss intelligently subjects similar to the ones suggested in this manual, and be able to relate them to what is being seen.

LEGAL IMPLICATIONS

The chief legal consideration of a visitation program is the extent of the company's liability in event of personal injury to a visitor. While the principle of law in this respect is fairly clear, the difficulty is in its application to a particular set of facts, which is ultimately a matter for the jury to determine. The safest general assumption, therefore, is that in such a program the owner is responsible for the safety of visitors, and that the courts may hold the company liable for any injuries except those which are entirely dissociated from the plant. The law divides visitors into two types:

1. *Licensee*—whose visit is allowed by "sufferance" of the owner, not by invitation, and who is acting for his own interest, benefit or amusement.

2. *Invitee*—whose visit is the result of an invitation by the owner, either expressed or implied, and which tends in some way to benefit the plant.

Although plant visits, as recommended in this manual, are usually

permitted only upon request or the visitor, it is implicit in the nature of the visits that the plant encourages them and is hopeful of some benefits. It seems reasonably certain, therefore, that such visitors would fall in the classification of invitee. This is important because the degree of care which the owner must exert to protect the visitor's safety is greater for invitees than for licensees.

Generally speaking, to protect the welfare of the licensee, the owner has a legal obligation only slightly greater than that for an ordinary trespasser, whereas for an invitee, the owner has a duty to exercise all reasonable care for his safety. Thus, when an injury occurs, many legal questions arise; first, it must be determined whether the visitor was a licensee or an invitee, and then whether the appropriate degree of care was exercised by the owner to prevent the injury.

There is almost no way of preventing a law suit to determine these questions, even when the plant pass which a visitor signs and carries specifies that the "company shall not be liable under any circumstances, etc." Lawyers advise that there is considerable doubt as to the validity of such so-called releases. Continued use of the form is recommended, however, because of its possible moral effect as a deterrent to indiscriminate or unwarranted claims.

As stated above, a company's liability with regard to "invitees" is much greater than in the case of a visitor of the "licensee" or "casual" type, and, in view of this, the question of areas to be visited, instructions to visitors before starting the tour and protective equipment to be used, should receive most careful consideration.

The visitation should be confined to safe areas, avoiding any area, building or location, where there are unusual or pronounced fire or explosion possibilities, or personal injury exposures: flammable vapor, dust or other flash fire hazards, hazardous materials subject to explosion or with quick intense burning characteristics, irritant or toxic gases, corrosive liquids, or other materials which may injure visitors or their wearing apparel; areas where there may be hazardous mists in the air; locations involving insecure footing or where shoes may contact objectionable or noxious materials; unsightly areas; etc.

The tour plans should include organized measures for removing visitors from areas of plant should untoward incidents occur such as injuries to employees, fires, explosions, release of toxic gases, etc. Should such an incident occur the guides, or acting hosts, should be instructed to remove the

(Continued)

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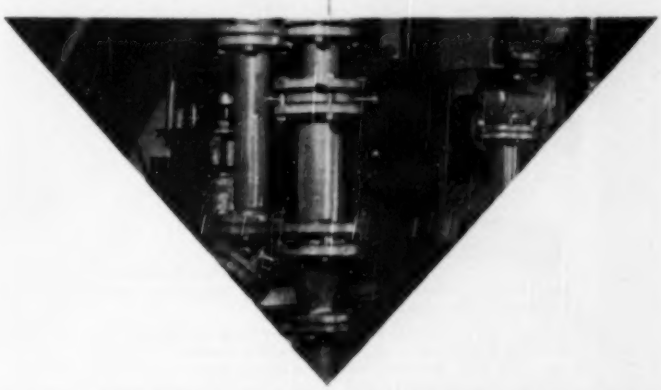

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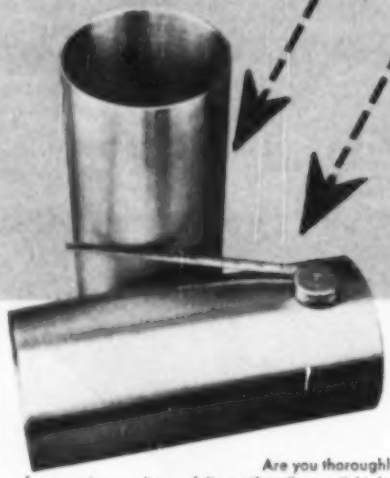

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M M & M, cont. . .

visitors by using as remote a route as possible so that they do not approach any nearer than is necessary to the location of the incident. They should also be carefully instructed as to measures to be used in case of individual or mass hysteria, panic, etc. The guide or host should be instructed to call upon reliable, responsible employees to help handling the visitors, to keep the group together and conduct them from the plant or area should it be necessary.

The host or guide should be familiar with protective measures to prevent fires or explosions, or personal injuries to enable him to answer intelligently questions that may be asked without indicating an acute exposure or alarming the visitors or those with whom they may discuss their visit after they leave the plant. If calling attention to unusual protective devices may indicate an inherently dangerous condition, it should be avoided. Should it seem necessary or desirable to point out or describe inherently hazardous materials or operations, care should be taken to explain the safeguards provided so that the employees are not endangered. If protective devices or safeguards are mentioned the guide should convey the impression that adequate safety and protective measures are in use so that the plant or area is a safe and pleasant place to work.

Visitors should be supplied with the necessary protective equipment depending upon parts of plant visited, exposures, etc. The use of equipment should be kept to a minimum and, when supplied, its need or its object should be explained. It may be desirable during the tour to call to the attention of the visitors the safeguards which have been provided. They should be limited to the common type of protective devices, such as first aid, fire equipment, guards around gears and belts, safety goggles, etc., which will probably prove very interesting and unique to them although quite commonplace to the employees.

Generally speaking, visitors should be at least 16 years old.

It should be realized, as brought out heretofore, that in inviting people to visit a plant or parts of a plant, the company accepts a definite responsibility for their safety and should a visitor be injured it would be most embarrassing to the company, and, in all probability quite costly, which emphasizes the need of carefully organizing plant visits, perhaps even giving the consideration to types of visitors, etc. Obviously an intoxicated or highly nervous person should not be included in tour groups. —End

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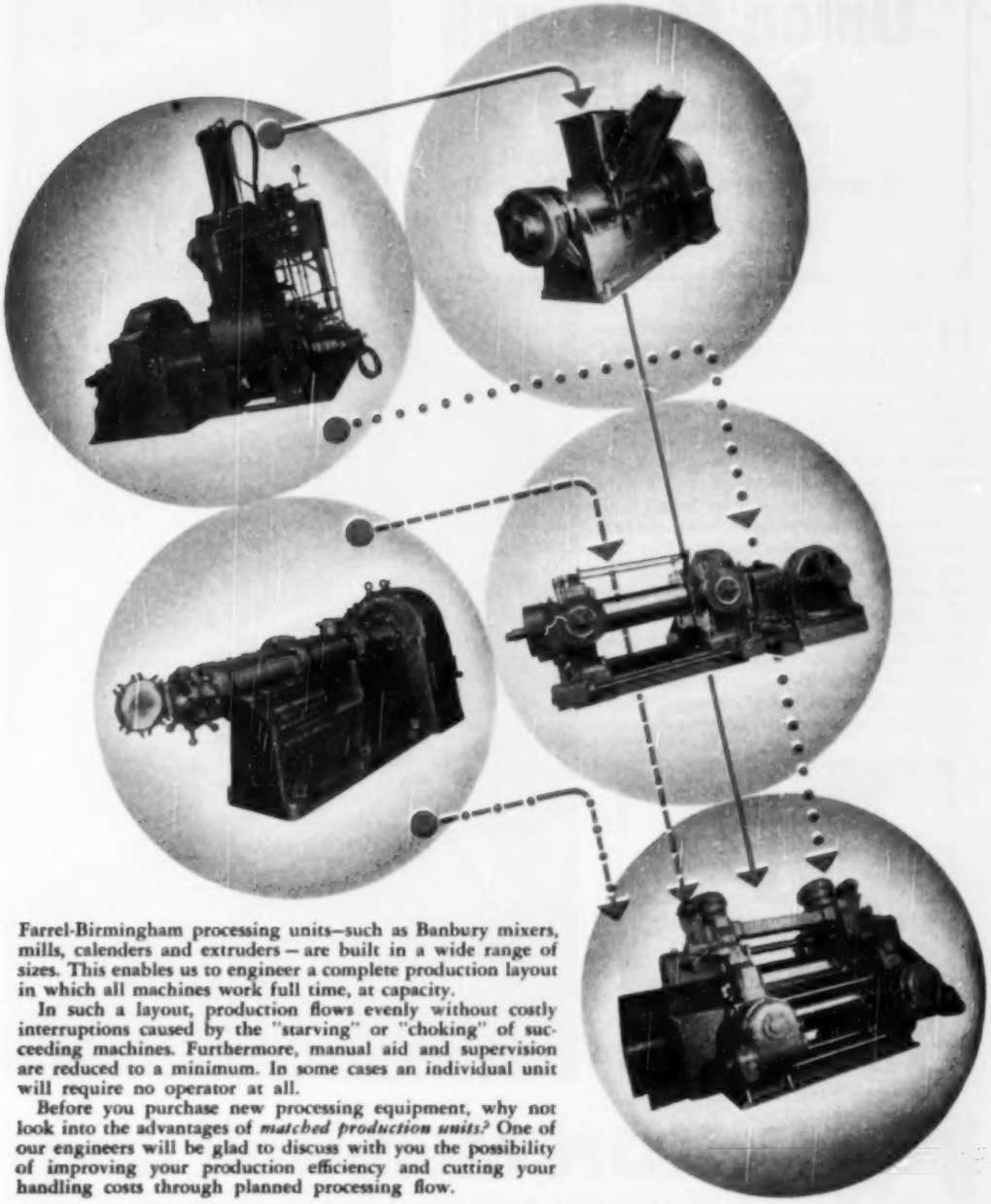

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Packaging Notebook—II

CARBOYS

Know-how is essential for proper handling

NOTE:—*This is the second in a series on carboys. The first appeared in December 1949.*—EDITOR.

Hazards attending the transportation and use of corrosive liquids make it necessary to employ the most painstaking packaging and handling practices. It is a moral obligation of all shippers to pack these compounds in the best and safest containers obtainable and to see that these packages are maintained in first class condition. Glass carboys are generally used for transporting mineral acids. They are not the fragile containers that their name implies. When properly cushioned and suspended in strong wooden boxes, these containers are extremely rugged, as testified by their record in transportation.

MCA SPREADS THE WORD

Through their many years of use, certain safe loading, handling, storing, and emptying practices have been evolved. These practices have mostly been established by the Glass and Wooden Packages Committee of the MCA. They have studied the problems as they have arisen and have devised solutions based on scientific investigations and the wide experience of the industry. The procedures which have been adopted as a result of this work are published in the form of bulletins. Known as Manual Sheets C-1, C-2, C-3, and C-3A they may be obtained from the association at a nominal cost.

A small group of pioneers in the field of chemical packaging had the foresight to recognize the importance of developing safe carboys and preparing safe handling procedures. These accomplishments will be a lasting testimonial to the effective work of M. F. Crass of E. I. Du Pont de Nemours & Co. who retired some years ago, the late Col. G. E. Carleton of the Bureau of Explosives, the late T. P. Callahan of Monsanto Chemical Co., and the late W. N. Watson, of the Manufacturing Chemists Association.

The December issue of *Chemical Engineering* listed the available types of carboys and described the features of their constructions. This will provide a guide in the selection of the container. Choice of the carboy is just the first step in any packaging program. The packages must be tested as required by the ICC, they must be maintained in good condition and rigid procedures for inspection, washing, recoopering, filling, storing, and handling must be adopted. Safety depends on careful and persistent attention to the use of good practices in all operations. Working areas should be well lighted, properly ventilated, clean, and housekeeping should always be of the best. Water should be readily available in case of accident. Workmen should be carefully trained in safe operating procedures and they should wear proper safety equipment such as goggles, rubber boots, gloves and aprons. All tools and equipment used in this work should be kept in first class condition.

ICC MAKES THE RULES

Carboys used for shipping dangerous, flammable, corrosive, and poisonous liquids must be fabricated to comply with the specifications of the ICC Regulations for the Transportation of Dangerous Articles. ICC Spec. 1A covers the conventional carboys of 5 and 13 gal. capacity, Spec. 1D is for the 6½-gal. container and Spec. IX covers the 5 and 6-gal. package used for export shipments. The latter is authorized for single trips only. These specifications prescribe methods of closure and require that carboys pass impact tests every six months.

Both new and used containers must be tested. A new carboy is a package containing a new or used bottle packed in a new box with new packing. The test prescribes that 90 percent of the packages filled with water must withstand the required swing test without breaking. An inspector of the Bureau of Explosives witnesses one of the semi-annual tests. Reports must be submitted to the bureau on their Form 6 and signed by the shipper. Any shipper who regularly fills and ships dangerous liquids in carboys is required to make these tests. Exemption from the tests applies only in the case of a distributing station which fills carboys for a single shipment and where carboys are obtained from another plant where proper reconditioning and periodic tests are made.

USE THE RIGHT GASKET

The high vapor pressures of most acids require venting type closures for carboys. The porous clay stopper used with 98 percent pure asbestos rope gasketing material has served as a safe closure for many years. Usually two complete winds of asbestos rope around the flange of the stopper provides the best seal. The outside end of the rope is tucked under to prevent gasket displacement. Some shippers remove most of the twist in the rope before applying it while others prefer to retain the twist. Gaskets are more leakproof if treated with a paraffin or a mixture of paraffin and mineral oil prior to application. This is particularly true when used for sealing nitric acid carboys. Pure gum rubber gaskets provide the best seals for muriatic acid carboys.

Stoppers are fastened to bottles by means of soft steel wire of not lighter than 14 Bwg. This wire is looped at one end by the supplier. The loop is placed around the bottle neck below the lip. The single wire is passed over the top of the stopper and down to the other side of the loop around which it is twisted. Although the regulations require the use of one wire only some shippers use two applied at right angles to each other. Wires are always exposed to corrosion from gases which pass through the stopper. To minimize this, wires are coated with a bituminous compound having maximum flexibility. Sometimes wires heavier than 14 Bwg. are used. Often chrome nickel wires are used for securing stoppers of carboys containing nitric acid.

Unless sufficient outage is left in

(*Continued*)

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bottles there is always danger of contents overflowing when filled carboys are subjected to extreme changes in temperature. Outage standards should be set for each product and filling practices established. There should always be a minimum outage of 6 in. from the top of the bottle and some liquids under certain climatic conditions may require outages of more than that.

Carboys should be stored under cover but if this is not possible they should be kept off the ground with dunnage of sufficient thickness to allow free circulation of air. Empty carboys should be stored on their sides with necks projecting in one direction. Filled carboys should not be tiered except when palletized. The use of supports between pallets permits tiering. Nitric acid carboys should be limited to two tiers high and they should be kept out of the sun. It is well to loosen the stoppers of filled carboys in hot weather—they can be tightened just prior to shipment.

POINTERS FOR SAFE POURING

Employees should be trained in safe methods of handling filled carboys. Before moving, the closure should be inspected to make sure that it is tight and leakproof. Grasping of the bottle by the neck should be avoided. Likewise thrusting a hand through hole in the box top is unsafe and if this grip is used to move the carboy there is danger of damaging the cover. Carboys should not be walked or turned on their bottoms any more than necessary. Bottle tops should be pointed away from handlers and they should be far enough away from the container to be safe from splashing in case the bottle breaks. There are hand trucks available, the lips of which extend under the bottoms of the box or under the carrying cleats which keep the workers a safe distance from the carboy.

The use of neck protections such as hoods, caps or hats for domestic shipments is an unsafe practice because it does not allow the handler to see the condition of the closure. Neck protections are required for export shipments because carboys are usually stored on deck.

Recommendations for loading and bracing of carload and less-than-carload shipments of filled and empty carboys are covered in Bureau of Explosive's Pamphlet 6 and in the MCA carboy manuals. The MCA is currently studying loading practices and some revisions may be recommended.

In opening a carboy, the workmen should use the standard protective clothing and he should keep hands and face to the side and never over the bottle mouth. Wires should be cut—never broken by twisting because this latter method often results in cracking or chipping of the lip of the bottle.

There are many safe methods of emptying carboys—the best of which are use of tilters and siphons. No device requiring the use of air pressure is safe because glass bottles are not designed for pressure vessels.

DRAIN ALL CARBOYS DRY

It is a moral obligation of the emptier to be sure that all carboys which he empties are thoroughly drained. Failure to do this not only violates the ICC regulations but endangers all handlers of the empty carboys.

When carboys are returned, they should be carefully inspected—usually after washing. Carboy bottoms should receive careful attention for obvious reasons. Nails are rapidly corroded, particularly those holding the bottoms. It is also important that the bottle be securely braced in the box. Any carboys requiring repairs should be so segregated that they cannot be refilled before repairs are made.

It has been found that cement coated sinker head nails are the most satisfactory of the available types. Metal corner braces have been used to secure the bottoms of the boxes.

Boxes are ordinarily constructed of New England or western pine of a minimum thickness of 25/32 in. although some prefer ¾-in. lumber. Various types of wood preservatives have been used experimentally but few shippers have adopted preservatives. Carrying cleats are sometimes beveled on the underside to provide better gripping. Bottom cleats must be fixed to the bottoms of the box so that they run parallel to the carrying cleats. Boxes are usually constructed of two types. In one type, each side overlaps one adjacent side and butts the other adjacent side. The other type has two parallel sides overlapping the other two sides. Corner posts are usually triangular in shape and should measure at least 1¼ in. on the sides bounding the 90 deg. angle. It is desirable to have at least 4 holes (½ in. dia.) drilled into the bottom of the box. This provides ventilation and allows free drainage. Box sides are straight edge, tongued and grooved or Linderman jointed. The last two are preferred because they usually prevent spillage through the sides if a filled bottle breaks. The hole in the box cover is a point of weakness. The board should be of sufficient width so that no joint is required. Use ¼ in. thick braces across the top as a support.

ICC Changes Apply to Many Chemical Shipments

Here are more changes in ICC regulations that apply to producers and consumers of chemicals. They are additions to last month's list.

Sec. 270 and 271 PHOSPHORUS OXYCHLORIDE, PHOSPHORUS TRICHLORIDE, & TRIOPHOSPHERYCHLORIDE. Spec. 60 portable tanks when lead-lined have been added to the list of approved containers.

Sec. 272 (o) (p) SULPHURIC ACID. Spec. 60 portable tanks have been added to the list of approved containers for acid of 1.5591 sp. gr. (52 deg. Be) or greater strength and for acid of not over 1.4 sp. gr. (42 deg. Be).

Sulphuric acid solutions not over 25 percent strength are exempt from the Regulations when packed in inside containers that are resistant to the lading of not over 8 fluid oz. capacity each and when packed in strong outside containers and when cushioned with sufficient absorbent material to completely absorb the contents. When for transportation by water containers must contain specified labels and be marked with name of contents.

Sec. 273 (d) SULPHUR TRIOXIDE when stabilized may be shipped in Spec. 103A and 103A-W tank cars in addition to previously authorized containers.

Sec. 279 ANISOYL CHLORIDE has been classed as a corrosive liquid and may be shipped in Spec. 5C and 5G stainless steel metal drums—flanges of the 5G drums must be welded in place. Containers of this compound of not over 8 oz. capacity in strong outside containers and cushioned with enough absorbent material to completely absorb contents shipments are exempt from the requirements of the Regulations except water shipments must contain the specified label and be marked with the name of the contents.

Sec. 303 (h) SULPHUR HEXAFLUORIDE is a compressed gas and must be packed in Spec. 3A1800 or Spec. 3 cylinders, the maximum filling density is 110 percent.

Sec. 302 (q) (1) MONOCHLORODIFLUOROMETHANE. The maximum filling density has been increased from 105 to 110 percent when packed in Spec. 106A500 or 105A300 tank cars.

Sec. 331A. HEXAETHYL TETRAPHOSPHATE, PARATHION, & TETRAETHYL PYROPHOSPHATE when packed in authorized cylinders may be packed in single trip fiberboard boxes containing not more than four cylinders. Valves must be protected and box must be able to stand a 6 ft. drop onto concrete without deformation or leakage of cylinders and valves.

Sec. 361 (g) (2) POISONOUS SOLIDS other than those for which special packing is prescribed may also be packed in Spec. 12B fiberboard boxes with securely closed inside fiberboard or chipboard boxes, capacity not over 6 lb. net weight. Interior boxes must be at least 0.028 in. thick for those whose capacity is not over 25 lb. and at least 0.034 in. thick for larger boxes. Maximum net weight in any shipping box must not be more than 24 lb. Both the interior container and the shipping box must be capable of standing a 4 ft. drop onto solid concrete without sifting or breaking.

Spec. 1A CARBOYS may now be fabricated from laminated wood if it complies with the other provisions of the specification.

Spec. 5C STAINLESS STEEL DRUMS. Amendments to this container specification include some changes in approved steel formulas as well as treatment after welding. Detailed corrosion tests with boiling nitric acid are prescribed. Several changes have been made in the details of the specifications for the openings.

Spec. 51 and Spec. 60 PORTABLE STEEL TANKS. These two new specifications cover the design and construction requirements for steel tanks which are ordinarily mounted on skids and are transported on motor trucks.

—*End*

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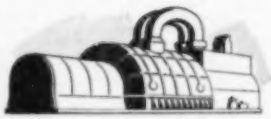

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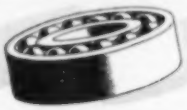

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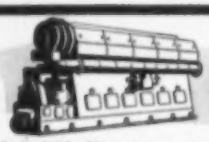

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GULF HARMONY OIL WCR—highly resistant to oxidation and gumming—ideal hydraulic oil.

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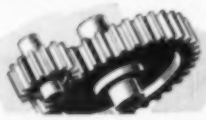

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News From Abroad

SPECIAL CORRESPONDENCE

Australian Firm to Make Silicon Esters

Perth—H. L. Brisbane & Wunderlich Ltd., West Australian ceramic manufacturing firm, is building a plant to produce 500 gal. of silicon esters weekly under its own patented process.

Originally obtaining its silester know-how from Silicon Organic Developments Ltd., Brisbane & Wunderlich set up for research of its own when the English laboratories were bought out by an American concern. There is still cooperation, however, with the similar laboratories in South Africa, Belgium and France.

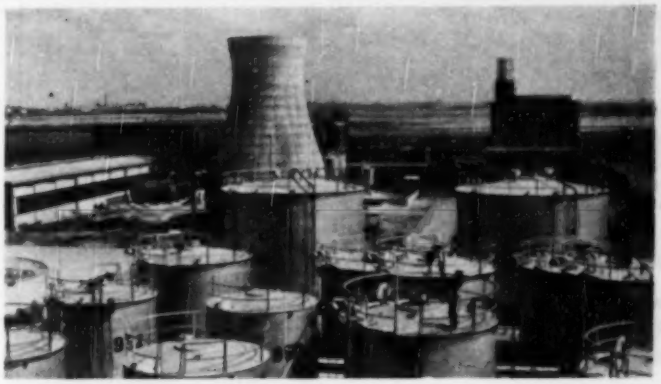
The Subiaco, Western Australia, laboratories have developed the use of organic condensing agents to produce silicon esters of superior characteristics in refractory work and other applications.

Ordinary silicon esters, the most common of which is ethyl silicate, are characterized by instability once partial hydrolysis has set in. The Australian silester are partially hydrolyzed solutions containing condensing agents which are claimed to enable: (1) controlled gel points, or speed of hydrolysis; (2) variable silica content and concomitant variation of mechanical properties; (3) permanent storage; (4) easily produced stable water emulsions and sols.

The series of silesters was originally developed for use as binders for refractory investments where metal pouring temperatures were too high for other types of bonding agents. Recently other applications have been developed, taking advantage of silesters' ability readily to hydrolize and during hydrolysis to produce an ultra fine, very reactive form of silica. This makes possible the bonding of natural and synthetic fillers, such as stone, refractories, sawdust and cellulosics.

Silesters also modify many ester and hydroxylic materials by chemical interchange reactions, imparting greater heat stability to paints and laminates.

Some applications have been developed by Australian paint firms and other sales outlets. Brisbane & Wunderlich is particularly interested in the prospect of producing textile emulsions of superior characteristics by the use of its patented condensation process. Such emulsions are useful in roughening yarn fibers such as nylon and making them more durable for subsequent heat and chemical processing. They are also used in delustering and slip prevention.



COMPETITION FOR EXPORT MARKETS

Dutch petrochemical output jumped higher when this new Royal Dutch Shell Oil unit at Pernis went on stream late in 1949. Supplied with raw materials from the firm's Rotterdam refinery, the unit produces detergents and polyvinyl chloride. Storage tanks of the ester salts unit are in the foreground. In rear is powder unit with evaporator on top.

Brazil Will Drill for Oil in Para Region

Rio de Janeiro—Drilling for oil will start in 1950 along the Tocantins River in the state of Para, the government's National Petroleum Council has announced.

Geologists believe there must be large amounts of petroleum in Brazil, but thus far the only producing area is near the city of Bahia, where output is small.

A total of 164 wells has been drilled in the Bahia region, of which 88 produce oil, 14 produce gas and 62 are dry. The Council estimates petroleum reserves in this region at 24 million barrels.

American firms provide technical help to the council in most of its surveys. Congress meanwhile is stalling on legislation which would enable American and other foreign oil companies to decide whether to seek participation in exploitation of the supposedly vast oil resources.

Germans Ready to Square Foreign Patent Claims

Munich—Foreign firms and individuals can now get squared away with Germany on the status of patents, trademarks and copyrights interrupted or impaired by the war.

Action on foreign claims has been made possible by the establishment in this city of a German Federal Patent Office, the first federal agency to be set up under the new West German state.

Legislation adopted by the Allied High Commission on restitution of foreign rights makes it the responsibility of the individual to file claim

(Continued)

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(Large capacity burner similar to TYPE "S-A-R") is adaptable in combination with powdered coal burners in large boilers.

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(Where steam, *or* gas is available for atomizing) safely and efficiently burns *residuums* obtained from process.

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—the "AIROCOOL" Gas Burner in combination with a TYPE "S-A-R" Oil Burner.

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(Of venturi type), assures low turndown without burnback.

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with multi-vane type air diffuser to give a positive swirl to entering combustion air.

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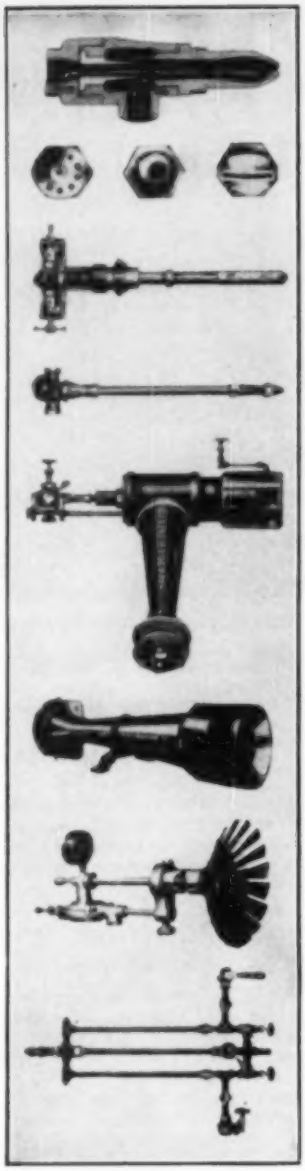
(Refuse Oil Burner) burns acids or caustic oils, sludges, asphalts, tank bottoms, polymer oils, heavy petrolatum, organic oil residuums, waste cutting oils, sulphite pulp liquors, etc.



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prior to Oct. 3, 1950. No fees are involved in reinstatement of rights.

Main objectives of the legislation are: (1) reinstatement of patent and trademark applications which were pending at the start of the war; (2) restoration of rights seized or invalidated by Germany during the war; (3) extension of duration of patents, trademarks and copyrights for period corresponding to date war opened between Germany and country concerned and Oct. 1, 1949; (4) extension of time for claiming in Germany the priority rights accorded by International Convention for Protection of Industry Property; (5) authorization to Germans to continue to exercise, under non-exclusive license, rights acquired bona fide during the war; and (6) preservation of right of Allied owner to institute proceedings within two years against Germans who infringed his right during war.

Dutch Nitrate Plant Due Back in Operation

Amsterdam—The coke and synthetic nitrate factory (Cie. Neerlandaise de l'Azote) at Sluiskil in the southwest part of Holland near the Belgian frontier, severely damaged during the war, is scheduled to start operation again. Personnel, for the present, will number 1,200.

India Pushes Cashew Oil For Plastics

Madras—Traditionally the world's largest exporter of cashew nuts, India is making strong efforts to develop the use of cashew shell oil for a domestic plastics industry. The Indian Institute of Science, Bangalore, and the Council of Scientific and Industrial Research Laboratories at New Delhi are testing pilot plant schemes for industrial uses of the liquid. And the Loyola College laboratories at Madras are at work on an exacting analysis of cashew shell oil's chemical construction.

Australian FirmBuys Into Indian Glass Firms

Bombay—Two Indian glass manufacturers have sold a substantial minority stock interest to Australian Consolidated Industries Pty., Ltd., which has undertaken to reorganize, modernize and expand their operations.

The Indian companies, owned by the same holding companies, are Bombay Glassworks Ltd. and Allahabad

Glassworks, Ltd. They will manufacture types of glass containers and window glass now patented by the Australian company.

Turkey Plans Petroleum Development Setup

Istanbul—The Turkish Government is planning the creation of a State Petroleum Organization, which will have the duty of developing petroleum sources, expansion of well drilling and developing the petroleum refining industry internally.

Sewage Gas Goes to Work in Australia

Melbourne — The Adelaide Engineering & Water Supply Department plans to utilize sewage gas for power generation and heating at three major-sized sewage treatment works in South Australia.

One installation, at Glenelg, has been in operation since 1942. Another, at Port Adelaide, was commissioned recently. A third, at Dry Creek, is in the preparatory stage.

Possibly because Australia has just entered this field of waste utilization, the plant designers have been able to profit from the mistakes of others and to adapt the best features of American and British practices. Thus the design of the screening plant and primary sedimentation tanks follows American practice while the aeration tanks and final settling tanks are based on British designs.

The mechanical installation at Glenelg consist of two 220 hp. dual-fuel gas-oil engines driving rotary compressors, and one 165 hp. dual-fuel gas-oil engine driving a 100 kva. alternator. Based on tests, a total heat recovery of about 72-75 percent is possible with this plant.

While at Glenelg one of the two primary digestion tanks is provided with a floating cover and the other mounted with a spiral carriage gas holder, both tanks at Port Adelaide have fixed covers and a spiral carriage gas holder is mounted in a separate tank. The mechanical installation at Port Adelaide consists of two 275 hp. dual-fuel engines which are direct-coupled to two 22 kva. three-phase alternators.

The projected plant at Dry Creek has been designed for a connected population of 279,000. It will be much larger than the first two installations. It will handle more than 110,000 lb. of volatile solids a day, including all the waste from the metropolitan abattoirs. The gas yield is expected to

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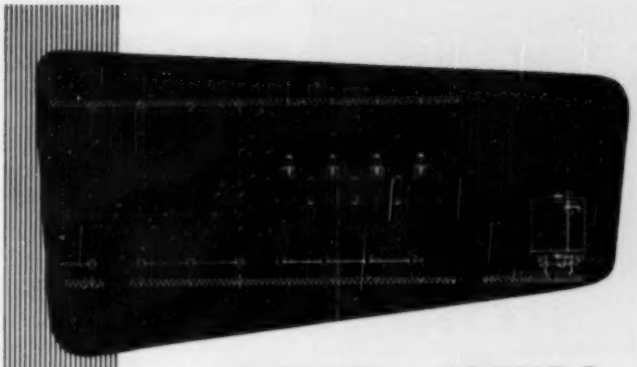
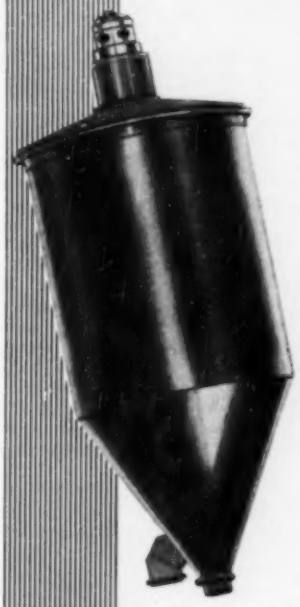


UNIFORM BLENDS By the Carload!



The Mixing Problem was typically modern . . . calling for super capacities with absolute uniformity to the last ounce. 1400 cu. ft. of ceramic moulding powder base were involved in each batch. Variations in moisture content between batches were objectionable.

From *Sprout - Waldron came the final solution.* First, six standard vertical mixers were each expanded to 300 cu. ft. These in turn were laced together with an ingenious system of screw conveyors, percentage feeders, and automatic controls. Plenty complicated — but it was all within the scope of Sprout - Waldron know-how.

Whether your blending operations involve uniformity by carloads or grams, consult Sprout - Waldron first. A wealth of practical engineering experience and broad manufacturing facilities are at your disposal.

● Bulletin 44 tells the Sprout - Waldron Equipment Story. Write for it today! Sprout, Waldron & Co., Inc., 15 Waldron Street, Muncy, Pa.

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range from 825,000 to 869,000 cu. ft. per day. The design provides for a gas holder with a capacity of 290,000 cu. ft. (compared with 30,000 cu. ft. in the first two installations). It will consist of a steel tank 84 ft. internal diameter and 30 ft. high, mounted on a concrete base, and will be provided with two lifts each 30 ft. high.

The mechanical installation will consist of eight 650 hp. dual-fuel engines each driving a 600 kw. alternator.

British Chemical Exporters Expect More Intense World Competition

London—British trade negotiators are touring foreign capitals to adapt commercial agreements to devaluation. Chemical exporters are preparing for intensified international competition. Trade negotiations with Argentina, the most important market for British chemicals outside the commonwealth, are hanging fire pending a satisfactory arrangement for the meat contract prices. Sweden is the second largest market for British chemicals outside the commonwealth. Here a new trade and payments agreement has been concluded, which may well set the pattern for British trade relations with non-British countries. It provides for a substantial expansion of commerce in both directions and elimination of unnecessary restrictions.

Many other negotiations are in progress, and chemical exporters in Britain hope that these, together with the liberalization of trade among OEEC countries, will create rather more favorable marketing conditions for their goods than existed during the larger part of last year. The latest available official export statistics—for November—show that while British chemical shipments abroad as a whole fell off sales to North America in fact increased, no doubt as a result of devaluation. The price advantage which accrued to British industry from the currency move has been partially offset by higher cost of certain raw materials, transport and plant replacements, but in the chemical export field it may prove of all the greater consequence because it occurred at a time when British export prices for many chemicals had already begun to decline under the pressure of changed market conditions. This fact is well brought out by the following small table:

British Chemical Exports
(1938 = 100)

Quarter	Value	Volume	Price
4th, 1948	388	157	245
1st, 1949	404	165	245
2nd, 1949	395	161	244
3rd, 1949	359	149	238

It will be seen that the export setback last summer reversed the upward trend which had not been broken since the war. Most British exporters withstood the effect of minor price corrections in the world market, since export prices had risen more sharply than the controlled prices for domestic buyers. But a continuation of the downward trend would, of course, throw an entirely different light on the export situation. The setback in exports to soft-currency markets explains why British chemical manufacturers have sent larger quantities to hard-currency countries. These severely contested markets offered little attraction to British exporters while soft-currency markets absorbed practically unlimited supplies at good prices. Now negotiations with some of these countries prove rather difficult and prices are declining, so more attention is being paid to hard-currency areas. Official admonitions, government-sponsored experiments in cooperating marketing and the effect of devaluation have, of course, a great deal to do with this shift towards dollar markets.

Meanwhile strenuous efforts are being made to replace chemicals from dollar countries by home-produced substitutes and to extend the range of British manufactures by production in British plant of chemicals hitherto imported from abroad. In some of these projects U.S. interests play a leading part. Thus E. R. Squibb & Sons, New York, plan to invest £350,000 in manufacturing facilities for several of their standard medicinal and pharmaceutical products in the United Kingdom; what is of particular interest is that the new British subsidiary intends to ship most of its output to other ECA countries. A similar case, in which however a United States process only and not United States capital is to be used, concerns Armour & Co., of Chicago. Hess Products Ltd. hopes to begin within the next few weeks the distillation of fatty acids by the fractional distillation process of the Chicago firm, producing commercial quantities of fatty acids of a purity which was not formerly obtainable in Britain; a new plant for this manufacture has been built at Littleborough, Lancashire.

Replacement of imports continues to account for many new projects and extensions in Britain's chemical indus-

try. Howards & Sons Ltd. are engaged on a development program to be completed by about 1952, which is expected to save about £210,000 of imports and supply about £175,000 of additional exports. The British Chemicals and Biologicals, Ltd., group has completed a new plant for the manufacture of hydrazine hydrate and now supplies 60 percent hydrazine hydrate in ton lots. Hydrazine sulphate, hydrobromide, hydrochloride and nitrate are also being manufactured, and 90 and 100 percent hydrazine hydrate are available in research quantities. British Industrial Solvents, Ltd., is producing dinonyl phthalate in pilot plant quantities for experimental purposes. Other new products are being offered by Amber Chemical Industries Ltd. Aureomycin and Chloromycetin are now being made in Britain, but all available supplies are for the time being purchased and distributed by the Ministry of Health.

MORE CHEMICALS FOR BRITAIN

While thus the range of British-made chemicals is being steadily extended month after month, it seems likely that the downward trend of chemical imports will be at least temporarily arrested in 1950. Recent trade arrangements with Japan make provision for certain imports of chemicals from Japan, and the commercial negotiations to begin shortly with Western Germany are almost certain to result in an increase in German supplies of certain chemicals, especially potash compounds, to the British Isles. "I.G." waxes and German decahydronaphthalene (Dekalin) are once more offered in the British home market. A long list of chemical products has been published which will be allowed to be imported without quantitative restrictions from many foreign countries, though not from the United States and other hard-currency areas. The liberalization of intra-European trade should certainly help to increase chemical exchanges. If it also tends to create more competitive conditions in the British home market, official circles which are now attaching growing importance to lowering costs and prices will not feel sorry.

It has unfortunately become necessary, as part of the investment cuts, to suspend work on the third atomic pile at Sellafield, Cumberland. This was to have been a larger pile than the other two being built but only the foundations have been laid. The number of workers at Sellafield will not be reduced, and it is expected that other work on this site will now proceed more quickly. One of the principal functions of the Sellafield plant is the

(Continued)

*5 Additional KETTLE DESIGNS by PATTERSON-KELLEY

K Vacuum Wax Impregnating Centrifuge

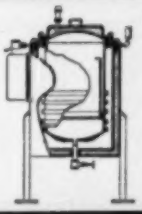
Steam-Jacketed with upper and lower chambers under separate pressure controls. Hot wax is in lower chamber while basket is being charged. For impregnating phase, wax is forced to upper chamber; after impregnation, pressures in two chambers are equalized and the basket spun to eliminate excess wax which returns to lower chamber.

L High Pressure Hydrogenator

Combines electrical and steam heating; steam passing through an internal coil being used to shorten initial heating-up period; electrical heating elements provide desired high operating temperature. Reaction completed, cold water is admitted to steam coil to promote rapid cooling.

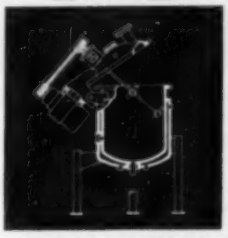
M Nicotine Extractor

Heavy duty unit for processing powdered tobacco; meets the need for scraping type agitator and sparger system for uniform distribution of steam to all parts of the charge; steam enters through sealed hollow shaft at the top, passes out through perforated paddle arms; special dump valve at bottom.



N High Pressure, Electrically-Heated Sterilizer

Completely self-contained with automatic pressure control switch, safety valve and insulated jacket.



O Vacuum Process Vessel

Sanitary type; unique setting of motor counter balancing quick opening cover, permits quick and clear access for cleaning out; all interior parts polished; multi-speed motor.

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production of uranium and plutonium. Meanwhile the first full trial of the frequency modulated cyclotron at Harwell, another one of the government's atomic energy research centers, was carried out successfully early in December. The acceleration of movement of the atomic nuclei—up to 95,000 mi. per sec.—is achieved by an accelerating voltage of a short wave radio oscillator applied in successive steps. At the moment the machine is producing a total accelerating voltage of about 160,000,000 v., which will finally be increased to 180,000,000 v. or more. The magnet of the cyclotron, described as the largest in Europe, contains 700 tons of steel; its oil-cooled energizing winding contains 80 tons of copper and consumes over 300 kw. of electric power. The oscillator can give a maximum power of 150 kw. The nuclei of most atoms can be broken up by the Harwell cyclotron. The particles being accelerated are the atomic nuclei of hydrogen.

Lower Oil Prices Hurt Indian Exports

New Delhi—Oil and oilseeds exports from India have fallen heavily as a result of lower prices prevailing in other supply areas. Government figures just released show that shipments in the July-September 1949 period were: groundnut oil, down from 9,000 metric tons in the previous period to 1,400 metric tons, linseed oil from 2,100 to 1,200 metric tons, groundnut seeds from 22,000 to 4,600 metric tons. Linseed (whole) rose from 18,000 to 22,000 metric tons, however.

India Drops Tariffs on Phosphates

New Delhi—The Indian Tariff Board has decided to drop protective tariffs on phosphates and phosphoric acid and the government has agreed to convert them to revenue duties. Reason: there no longer is any Indian industry to protect. The only Indian producer went out of business last March. And imports into India, according to the Tariff Board, amount to only $70,000 worth a year.

Tata Feels Pinch of Lower Alkali Prices

Bombay—Heavy imports of soda ash and caustic soda which cut into India prices and production brought the profits of Tata Chemicals Ltd. down from Rs. 2,468,000 in 1947-48 to a mere Rs. 300,000 in 1948-49—

or about $63,000 at current exchange rates.

In the ten months before the soda ash section shut down last April, the new 1948-49 annual report reveals, production was well above the total for the whole previous year as a result of modifications.

Liquid Carbonic Canadian CO_2 Capacities Expanding

Vancouver—Work has started on erection of a new carbon monoxide plant at Marpole, B. C., at a cost of $500,000. On completion of the new plant the present plant of the company at Eleventh Ave. and Yew St., Vancouver, B. C., will be dismantled and shipped to Jamaica, according to R. C. Holbrook, president of Liquid Carbonic Canadian Corp. Ltd. The new plant will produce 2,400 lb. per hr. and will employ 30 persons. This is four times the capacity of the old plant.

When opened next summer, the plant will be the most modern of the company's eight in Canada. After the new operations commence, the 30-year-old Yew Street plant will be shipped to Jamaica and the Vancouver building put up for sale.

A. W. Butler of Vancouver is manager for British Columbia.

Brazil Buys British Rayon Spinning Equipment

London—Lancashire textile machinery makers have secured a large contract, valued at nearly £500,000, for the supply of plant to a Brazilian rayon factory. Two firms, Dobson and Barlow, and Lustrafil, are concerned. The contract is for the exclusive rights in Brazil for the Nelson process for continuous rayon spinning, and has been concluded with Industries Reunides of Matarazzo, near Sao Paulo. The agreement includes the supply of a large number of Nelson spinning machines which will be manufactured by Dobson and Barlow and erected in a special section of the Matarazzo rayon factory.

More Delays on Sindhri's Ammonium Sulphate Plant

New Delhi—Delays in deliveries of equipment (some of it ordered as much as four years ago) are blamed in the latest official announcement which reveals that the 350,000 metric ton ammonium sulphate factory at Sindhri, Bihar, is not likely to go into production for at least another year. Actual construction work got under way three years back. —*End*

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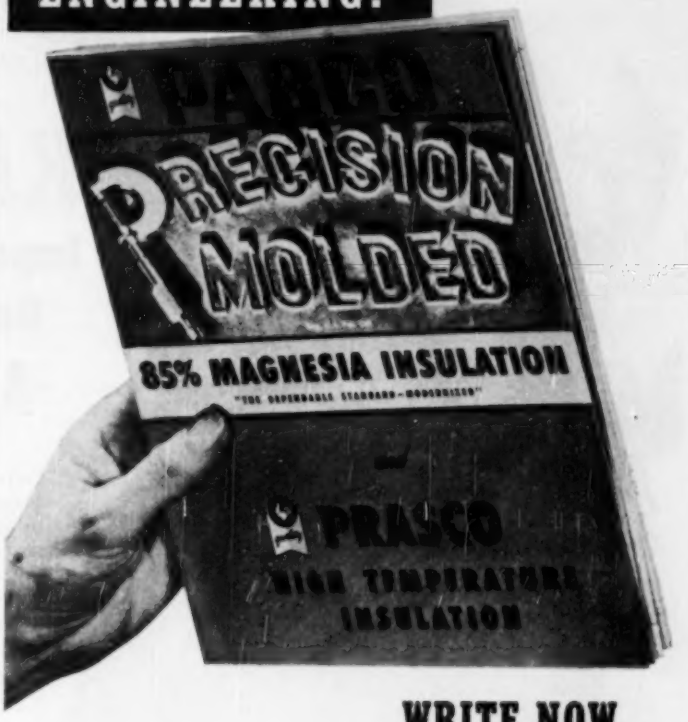

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The Corrosion Forum

EDMOND C. FETTER, Managing Editor

Caustic Soda versus Construction Materials

Part III of a symposium in which a representative group of construction materials are evaluated for services involving caustic soda.

Carbon and Graphite

R. O. JOSLYN, *National Carbon Co., Cleveland, Ohio.*

Carbon, graphite and Karbate impervious carbon and graphite (Grades 11 and 21) are inert to all concentrations of sodium hydroxide. Temperature of the caustic soda has no effect on the chemical resistance of these materials, although the impervious forms are not recommended for use at operating temperatures above 340 deg. F. It is significant that, in addition to their complete resistance to caustic, these materials are also unattacked by most acids, salts and organic compounds.

For many years carbon raschig rings have been the standard packing material for alkaline scrubbing towers, operated in such processes as the removal of sulphur from hydrocarbons. Continuous service, even in boiling concentrated caustic soda, has had no detrimental effect on the carbon rings. Such towers frequently are lined with carbon brick and employ distributor plates, packing support grids and other accessories of carbon and graphite construction. Graphite bubble caps and trays are offering excellent service in process towers where conditions change repeatedly from strong caustic to strong acid. These towers are lined with carbon brick and graphite slabs. Brick-lined tanks and digesters, etc., for caustic service employ carbon brick almost exclusively.

The contamination of caustic solutions by metallic and siliceous impurities is frequently undesirable in the chemical, rayon, and textile industries. Karbate heat exchangers, pumps, pipe, fittings, valves and other types of process equipment have been selected by many operators to insure protection against such contamination. Pressure filters employing porous carbon tube filter elements are in wide use on caustic solutions. Satisfactory clarity of effluent is obtained without pre-coats or filter aids.

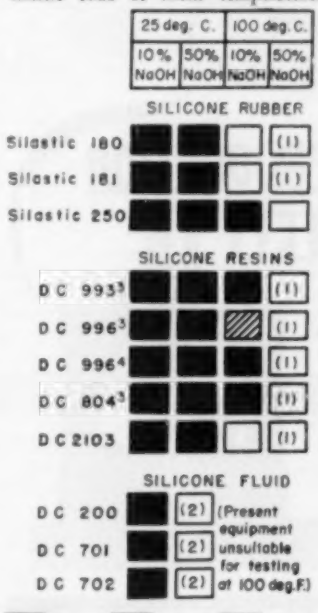
Karbate heat exchangers are used successfully in the production of sodium hypochlorite, both for pre-cooling the caustic and for removing the heat of chlorination from the hypochlorite solution.

It is frequently necessary to remove deposited scale from heat transfer equipment by treatment with hot caustic solutions. The resistance of Karbate impervious graphite to these caustic cleaning solutions as well as to acids and organic compounds often recommends its selection over other materials of construction.

Silicones

W. J. HARGREAVES and FRANCES HENSON, *Dow Corning Corp., Midland, Mich.*

With some exceptions, commercial silicones have excellent resistance to caustic soda at room temperature.



Tested and rated according to ASTM D-543-42; complete data on request to *Chemical Engineering*, Corrosion Forum Editor. [3]Completely disintegrated. [4]Gelled. [5]Cured at 250 deg. C. [6]Cured at 150 deg. C.

Good resistance is maintained in contact with 10 percent NaOH at 100 deg. C. Most silicones are severely attacked, however, by 50 percent NaOH at 100 deg. C. Specific data on the resistance of silicone rubbers, resins and fluids to caustic soda in concentrations of 10 and 50 percent at 25 and 100 deg. C. are given below. The chart summarizes test results.

SILICONE RUBBER

Test samples made from three Dow Corning silicone rubber stocks, were exposed to 10 and 50 percent NaOH at both 25 and 100 deg. C. Silastic 180 and Silastic 181 were selected for these tests because of their exceptional resistance to corrosive chemicals, and Silastic 250 was tested because it is a new type of silicone rubber in which mechanical strength has been greatly increased.

Little change was noted in any of the Silastic samples exposed to 10 and 50 percent NaOH at room temperature. Silastic 180 and Silastic 181 showed poor resistance to caustic soda at 100 deg. C. Silastic 250, however, showed good resistance to 10 percent caustic at 100 deg. C. Its resistance to 50 percent NaOH at 100 deg. C. is rated as poor even though the samples recovered 78 percent of their original Shore Efficiency.

SILICONE RESINS

Silicone resins have good resistance to 10 and 50 percent concentrations of caustic soda at room temperatures. With the exception of DC 2103, the silicone resins also had good resistance to 10 percent NaOH at 100 deg. C. All resins were completely disintegrated by 50 percent NaOH at 100 deg. C.

SILICONE FLUIDS

Very little change was noted in the viscosity of DC 200, DC 701 and DC 703 silicone fluids after exposure to 10 percent NaOH at room temperature. The fluids gelled, however, when exposed to 50 percent NaOH at room temperature. Efforts to determine the effect of caustic soda on silicone fluids at 100 deg. C. were temporarily abandoned because of equipment limitations.

(*Continued*)

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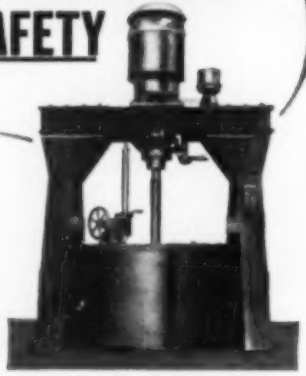

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Iron and Steel

ALBERT W. SPITZ, *Reiter Engineering Co., Philadelphia, Pa.*

Cast iron and carbon steel are used extensively for handling caustic soda solutions where slight iron contamination is not objectionable.

The corrosion rate increases with the temperature and concentration; the approximate limits for economical service being 100 deg. C. and a concentration of 75 percent.

Storage tanks for caustic solutions should have ample wall thickness, one leading manufacturer suggests ⅜ in. flange quality steel.

The tanks may be fusion welded if properly stress relieved or riveted and caulked inside and outside.

Piping should be welded, with a minimum number of flanged joints.

All iron pumps, valves, and cocks may be used. The use of more resistant alloys for pumps and valves, operating at the higher temperatures and concentrations is usually worth the additional cost.

Protective Coatings

KENNETH TATOR, *Kenneth Tator Associates, Coraopolis, Pa.*

Normally there are two considerations which influence the choice of protective coatings and linings in connection with caustic soda. The first of these is the fact that iron and steel are not seriously corroded by caustic soda solutions, and the second is in regard to the temperature limitations of the organic materials. Many of the uses of caustic soda, however, require that this material shall be free from iron contamination. This is particularly true in the use of caustic soda solutions in soap making where small iron concentrations will lead to serious product discoloration through the formation of dark iron soap. It is, therefore, common practice in the production, shipping, and storage of caustic soda solutions for such uses to interpose a protective barrier between these solutions and the steel of the processing equipment.

In general it may be said that all of the coating materials in successful use for corrosive prevention, with the exception of the phenolics, may be satisfactorily used for the handling of caustic soda solution. In satisfactory use we may cite the various natural and synthetic rubbers, vinyls, furanes, methacrylates, polystyrene, Saran, polyethylene, and the nylons.

With such a large number of materials to choose from it is apparent that consideration of cost, temperature and service life represent the determining factors in choice of material. With the exception of furane, which may be safely used at temperatures up to and often exceeding 275 deg. F., and neoprenes which may be used to temperatures up to 220 deg. F., the remaining materials have a top temperature limitation of approximately 180 deg. F. Durability of the lining or coating under operating conditions is the function of its thickness and resilience. Therefore,

(*Continued*)

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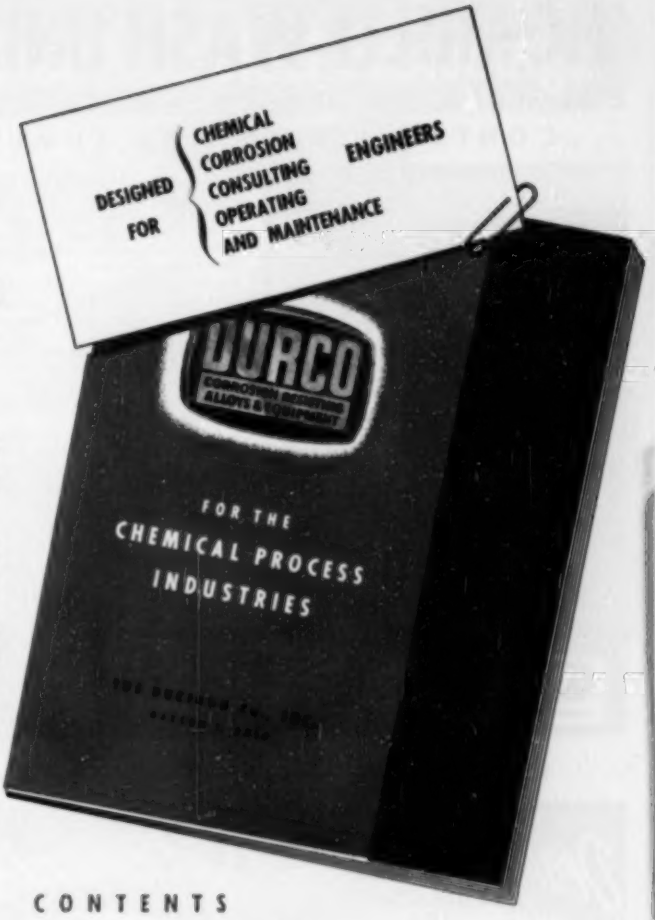

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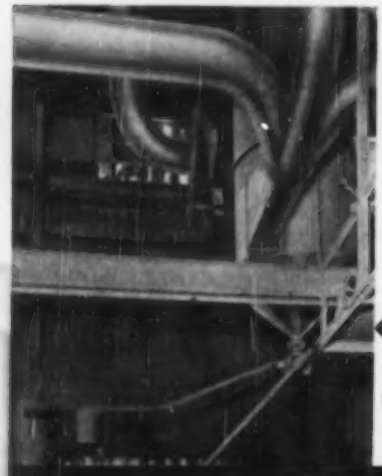

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The pump shown is a 10" Type "SW-OX" Frame 238X Pump used in certain facilities at Oak Ridge National Laboratory . . . one of many types of vertical and horizontal pumps for chemical plant applications.

This unit has neither submerged bearing nor stuffing box. The outlet is at the bottom to make it completely self-drainng.

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Nagle Pumps
INDUSTRIAL PUMPS FOR ABUSIVE APPLICATION
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for the most durable protection, films of rubber or synthetic rubber of approximately $\frac{1}{64}$ to $\frac{1}{32}$ in. thickness are commonly recommended. Where cost is the predominant factor, the force-dried vinyl coatings are in considerable use.

In selecting a coating or lining material, especially in the case of vinyls or rubber, it is important that compounding and plasticizing be accomplished with materials which are not reactive with caustic soda. For this reason it is usually undesirable to deposit coatings from water dispersion or from latex systems, as these often have an emulsifying or stabilizing agent which is susceptible to caustic action.

From the standpoint of cost, durability, and performance the writer favors a $\frac{1}{64}$ in. film of a spray coating of type KNR neoprene as a practical protection.

In the protection of base metals other than iron or steel which are readily attacked by caustic soda, such as aluminum or magnesium, the principles of protection under active corrosion conditions must be followed. In this case thin films should never be used, as any imperfection in application or subsequent injury would expose the base metal and cause rapid perforation of the equipment. Under these conditions, an organic barrier thickness of at least $\frac{1}{4}$ in. should be specified and the material should be of sufficient resilience to resist damage by normal impact and abrasion. Rubber linings are satisfactory and meet this requirement."

Nickel, Nickel Alloys

W. Z. FRIEND, *International Nickel Co., New York, N. Y.*

Operating experience over a long period has demonstrated that nickel is a highly satisfactory material for handling caustic soda and caustic potash at practically all concentrations and temperatures. Nickel also confers on its alloys a high degree of resistance to these alkalis. For example, Monel, containing approximately two-thirds nickel and one-third copper, and Inconel, containing nominally 78.5 percent Ni, 14 Cr, and 6.5 Fe, have resistance to caustic solutions of the same order as that of nickel. Similarly, additions of nickel to cast iron and steel greatly improve their resistance to corrosion by caustic alkalis.

Nickel and nickel-clad steel are standard materials for construction of evaporators handling the evaporation of sodium and potassium hydroxides to 50 percent concentration and higher. Nickel-clad steel is used for storage tanks handling 50 and 70 percent caustic and for tank cars handling 75 percent caustic soda. Nickel pumps, valves and piping are used for handling hot 70 percent solutions. The results of corrosion tests in caustic soda evaporation are given in Table I. The results of corrosion tests in the storage of hot 75 percent caustic soda are shown in Table II.

The beneficial effect of nickel additions to the corrosion resistance of cast irons in caustic soda solutions is indicated by the test data in Table III. It is evident that nickel contents of 15 to 30 percent pro-

(Continued)

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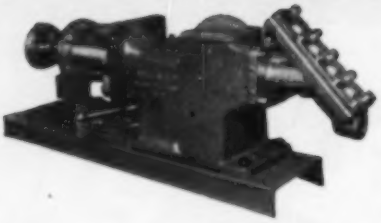

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vide very marked improvement in resistance to corrosion as compared to unalloyed cast iron. It also is apparent that as low a nickel content as 3 to 5 percent nearly doubles the resistance of cast iron. The Ni-Resist alloys are extensively used for pumps, valves and other equipment handling hot caustic solutions up to 50 percent concentration and sometimes higher. Type 2 Ni-Resist (Copper-free) is used where freedom from copper contamination of the solution is desired. Type 3 Ni-Resist (30 Ni) is used where a material of low thermal expansion coefficient is desired.

Table I—Resistance of Nickel and Nickel Alloys in Caustic Evaporation

Plant test in evaporator concentrating caustic soda to 50 percent. Duration 35 days.

	Corrosion Rates, Mils per Yr.
Nickel	0.1
Inconel	0.3
Ni-Resist (Type 1)	4
Ni-Resist (Type 2)	2.6
Nickel cast iron (3% Ni)	9
Cast iron	22

Laboratory tests in caustic soda being concentrated from 60 to 75 percent. Temp. 300–350 F.

Monel	4.7
Nickel	1.0

Table II—Plant Test in 75 Percent Ammonia-Soda Caustic in Receiving Tank

(Temp. 275 F; duration 35 days.)

	Corrosion Rate, Mils Per Yr.
Nickel	1.6
Monel	1.7
Inconel	1.3
Ni-Resist (Type 1)	4
Cast iron	73
Mild steel	71

Table III—Effect of Nickel Additions on Corrosion Rates of Cast Irons in 50 to 65 Percent Caustic Soda

(Boiling under 26-in.-Hg vac.; duration 81 days.)

Nickel Content, %	Corrosion Rate, Mils Per Yr.
0	73
0	91
0	86
3.5	47
5	49
15	30
20	3.3
20 (+2% Cr)	6.0
30	0.4

Low-carbon nickel and low carbon nickel-clad steel are being successfully used in the production of anhydrous caustic soda and caustic potash by continuous evaporation, where the chlorate content of the caustic is very low. Inconel also is being used for evaporating tubes in production of high strength caustic where contamination of the solution by a small amount of chromium is not objectionable. Both low-carbon nickel and Inconel are used as reactors for organic caustic fusions, Inconel being preferred where sulphur compounds are present. Inconel equipment must be stress-relieved before use in any of these high temperature caustic applications.

(Continued)

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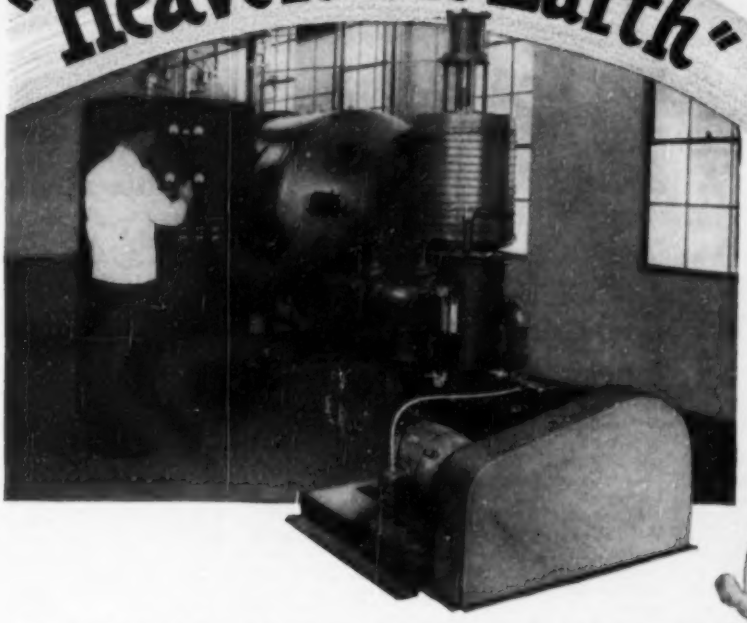

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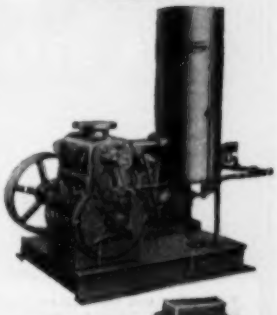

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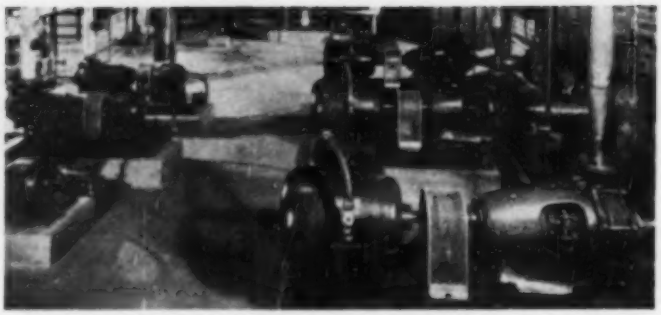
Durimet 20 provides excellent resistance to many concentrations of caustic soda and is currently being applied as chemical equipment where these solutions are handled in a wide variety of concentrations and temperatures. Plant experience of this type supports many plant and lab tests.

Durimet 20 is a highly alloyed austenitic stainless steel with a nominal chemical composition in the cast form of 29 percent Ni, 20 Cr, 2.5 Mo, 3.5 Cu, 1.0 Si, 0.07 C max. and balance Fe. It is available in the form of castings and equipment made from castings such as pumps, valves, fans, ejectors, jets and mixing nozzles.

Wrought Durimet 20 is produced by the Carpenter Steel Co. and is supplied under the name Carpenter Stainless No. 20. Presently the wrought alloy is available in the following forms: wire, rod, bars, strip, sheet, plate and welded pipe.

For a number of years there has been a definite prejudice in the alkali industry against all alloys containing chromium because of possible contamination to the caustic sufficient to cause discoloration. This prejudice, no doubt, resulted from the earlier use of chromium containing alloys which did not possess adequate resistance to the caustic condition handled. Thus, sufficient chromium contamination to cause objectionable discoloration resulted from a normal amount of corrosion. However, the relatively high nickel content of Durimet 20 imparts a sufficiently high degree of resistance to caustic solutions to render it an excellent alloy for many services. Present data indicate satisfactory resistance up to approximately 75 percent NaOH at the normal boiling temperatures and to about 300 deg. F. for concentrations above 75 percent. For the higher concentrations above 300 deg. F. there is a much greater tendency toward discoloration due to chromium and iron contamination.



DURIMET 20 pumps some of which are handling 5-10 percent caustic soda at 200 deg.

To exemplify the resistance exhibited by Durimet 20 to caustic soda, certain test and service data are cited below:

1. Laboratory corrosion tests conducted on Durimet 20 in 80 percent sodium hydroxide at 230 deg. F. showed no attack (no weight loss) after ten days' exposure.

2. Data obtained from a plant test of many weeks duration on 75 percent caustic at approximately 200 deg. F. showed a corrosion rate much less than 1 mil per year.

3. One alkali plant uses numerous Durimet valves for handling 10-50 percent caustic to their evaporators. Temperatures range from 150-212 deg. F. No trouble is being experienced due to corrosion after two years' service.

4. Another alkali plant conducted tests to find a suitable material for handling a molten alkali at temperatures between 650-850 deg. F. Although Durimet showed a relatively high rate of attack, it showed the best resistance of all the well-known alkali resisting alloys being twice as resistant as the next best alloy and many times superior to all others. —*End*

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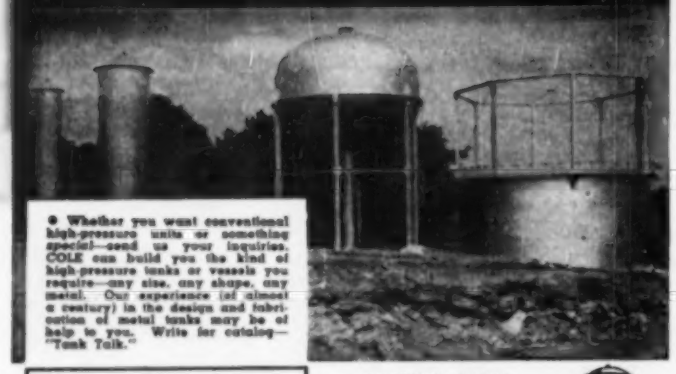

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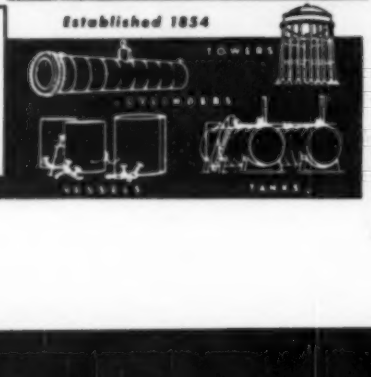

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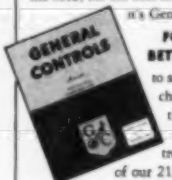

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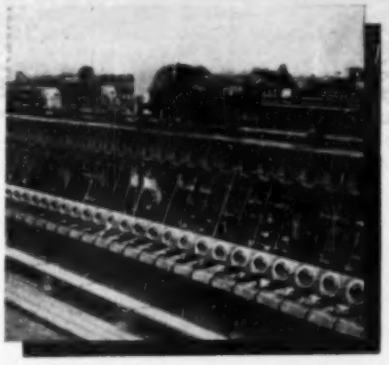

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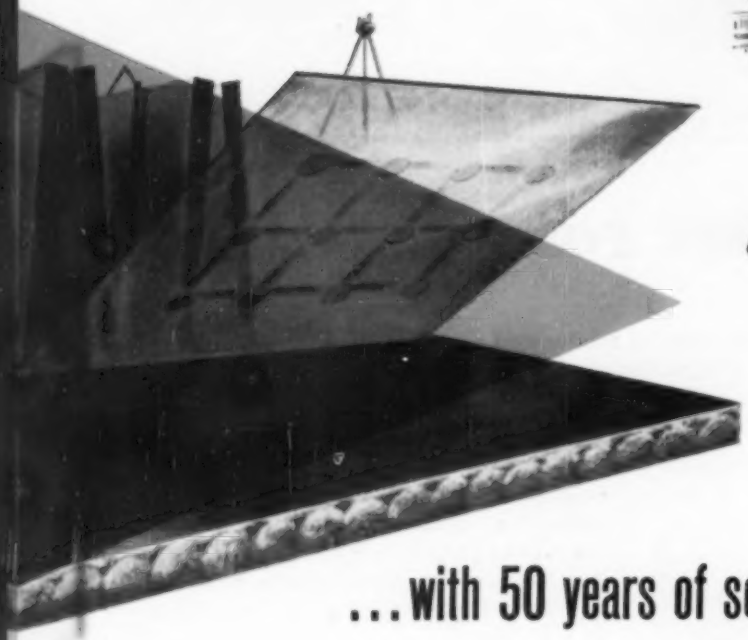

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Names in the News

MAN OF THE MONTH

Pierre S. du Pont

Pierre Samuel du Pont celebrated his 80th birthday on January 15. Who's Who labels him an industrialist and goes on to list a parade of accomplishments which could easily provide ten industrialists with brilliant careers.

His star rose with that of the Du Pont Co. When he joined Du Pont as a chemist in 1890, it was a moderate sized concern making one product with the aid of a few hundred employees. Within the next few years he was made assistant superintendent of the Brandywine Powder Mills, and afterwards superintendent of the Carney's Point Works. Then, after leaving the family business for three years to manage various properties in Ohio,—

"Three men—and I am the only one of the three who survives—purchased the Du Pont Co. in 1902. Today, there are about 105,000 stockholders." Thus Mr. Du Pont sums up the company's growth in a recent issue of the house organ, *Better Living*. And it might be added that he is, in great part, responsible for that growth. Since 1902, when he became treasurer, he has been active in the company's management. He was delegated acting president in 1909; president in 1915. In 1919 he became chairman of the board, a position which he held until his resignation in 1940. An aggressive spirit, in research and in investment, has guided the parallel success of the man and the company. Says Mr. Du Pont:

"The company's broad research program has resulted in a growing number of new products at lower cost."

He also played a part in the development of other industries. Thirty years ago when the Du Pont Co. invested in General Motors, it was he who directed its reorganization for mass production. He has been president of Christina Securities Co., director and honorary chairman of the Wilmington Trust Co., and director of the Pennsylvania Railroad.

Outside of his business activities he has always been much occupied with social progress—in fact on his home grounds, Wilmington and environs, he is better known as a civic leader than an industrialist. Improvement of education has been a primary interest. He once led a successful fight to put public education on its feet in Delaware.

Today Mr. Du Pont continues to spend most of his days in his office on the ninth floor of the Du Pont Bldg. Of late he has been collecting and organizing historical data about the Du Pont family and the Du Pont Co.

Earl L. Whitford had been named president and treasurer of Oldbury Electro-Chemical Co., Niagara Falls, N. Y. He succeeds **Walter Wallace** who has resigned.

Gustavus J. Esselen has been elected vice president of United States Testing Co., Boston.

J. Albert Woods has been elected to the board of directors of Commercial Solvents Corp., New York. He is president of Wilson & Toomer Fertilizer Co., Jacksonville, Fla.

Paul E. Klopsteg has been appointed to the Atomic Energy Commission security survey panel. He is director of research at the Technological Institute, Northwestern University.

E. T. Ladd has retired as vice president in charge of the Isco chemical division of Innis, Speiden & Co., Niagara Falls, New York.

Peter D. Cooper, vice president of Celanese Corp. of America, has been elected a member of the board of directors.

Frank J. Cahn has been made vice president in charge of research for Louis Milani Foods, Maywood, Calif.

Louis A. Pardue has been made chairman of the council of the Oak Ridge Institute of Nuclear Studies. He is dean of the University of Kentucky Graduate School.

William G. Krummrich has been elected a vice president of Monsanto Chemical Co., St. Louis 4, Mo. He is general manager of the organic chemicals division. **R. L. Sibley** has been made special assistant to the general manager of the organic chemicals division. **P. M. Tompkins** has been made the division's chief process engineer. **R. S. Wobus** succeeds him as plant manager.

Albert S. Woodard has been named chief engineer of Pennsylvania Salt Mfg. Co., Philadelphia. He has been acting chief engineer for the past year.

A. S. Woodard

T. F. Cooke

T. F. Cooke and H. E. Millson have been appointed assistant directors of the application research department, Calco division, American Cyanamid Co. Dr. Cooke heads the products application section. Mr. Millson is in charge of the dyes technical evaluation section.

A. Brothman has been made a consulting associate of Industrial Process Engineers, Newark, N. J. Mr. Brothman heads the engineering firm of A. Brothman & Associates, Long Island City, N. Y.

Myles S. Maxim has been transferred to the Dayton, Ohio, central research department of Monsanto Chemical Co., St. Louis, Mo. He was formerly with the Merrimac division at Everett, Mass.

E. Westervelt Dennis has been appointed director of the biological

(*Continued*)

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division of the Sterling-Winthrop Research Institute, a division of Sterling Drug Inc. He succeeds **Lloyd Miller** who has become director of revision of the United States Pharmacopeia.

Hugo Klein has become vice president and treasurer, and has been elected to the board of directors of RC Reproduction Production Products, Los Angeles.

Roger W. Truesdail, head of the Truesdail Laboratories, Inc. of Los Angeles, has been elected president of the American Council of Commercial Laboratories.

Paul F. Preston has been named engineering manager of the chemicals division of General Electric's chemical department in Pittsfield, Mass. **Zay Jeffries,** vice president in charge of the chemical department, has retired.

Paul J. Carlisle has retired from his position as manager of field research for Du Pont's electrochemicals department.

Stuart M. Phelps has been chosen by the American Ceramic Society to receive the 1950 Albert Victor Bleininger Award. He is director of research and tests, American Refractories Institute and a senior fellow of the Mellon Institute.

L. I. Stead has been appointed chief chemist for Chicago district plants of the Youngstown Sheet and Tube Co.

Henry B. Allen, executive vice president and secretary of the Franklin Institute of the State of Pennsylvania, was granted an honorary degree by Drexel Institute of Technology, Philadelphia.

F. L. Jones has been named manager of the research administration section of the central research department of Koppers Co., Pittsburgh, Pa. **W. J. Monacelli** has been made assistant manager of the department's patents section. **G. A. Webb** has been made assistant manager of the development section; **R. H. Hartigan,** assistant manager of the laboratory section; and **B. K. Pospishil,** manager of the experiment station at Kearny, N. J.

T. Richard Gascoigne has been named sales manager in charge of advertising sales of *Chemical Engineering,* McGraw-Hill Publishing Co., New York. For the past three years he has represented the American Chemical Society publications as an advertising sales representative in metropolitan New York and New Jersey for Reinhold Publishing Corp.

H. E. Bramston-Cook has been elected a vice president of Oronite Chemical Co., a subsidiary of Standard Oil Co. of California. **R. M. Miilu** has been made eastern sales manager.

H. Bramston-Cook

R. T. Pring

Robert T. Pring has been appointed technical director of the dust and fume division of American Wheelabrator & Equipment Corp., Mishawaka, Ind.

John McVeigh has been appointed special development engineer on the technical research staff of Kennametal Inc., Latrobe, Pa.

Wallace R. Brode has been elected editor of the Journal of the Optical Society of America. He is associate director of the National Bureau of Standards.

Paul F. Niessen has been elected to the board of directors of Victor Mfg. & Gasket Co., Chicago. He has been director of research and development.

Gunther H. Doerfert has been added to the staff of the Eastman organic chemical department of Distillation Products Industries.

A. B. Agnew, vice president in charge of operations of the Laclede-Christy Co. of St. Louis, Mo., has been elected a director.

Robert A. Anderson has been appointed vice president and works manager of the Ingersoll steel division of Borg-Warner Corp., Chicago.

William D. Appel, head of the textile section of the National Bureau of Standards, has been elected a fellow of the Textile Research Institute. **Herbert F. Schiefer** of the bureau's

(*Continued*)

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DIVERSITY of Applications to Research and Production

Electro-deposited in pure copper, pure nickel, or nickel-on-copper—in regular commercial production with counts from 25 to 400 per inch—in lengths up to 100 feet and widths up to 36 inches—with tolerances on hole size and thickness suitable for the most critical uses—LEKTROMESH is ideal for precise filtration, for fabricated products such as fuel filters and electronic shields, even for distinctive decorative screens with an integral pattern. For full details let us send our Bulletin on LEKTROMESH. Address Department 15.

THE C. O. JELLIFF MANUFACTURING CORPORATION SOUTHPORT, CONN.

NAMES IN THE NEWS, cont. . .

textile laboratory has been chosen the first recipient of the Harold DeWitt Smith Memorial Medal which will be presented at the spring meeting of the American Society for Testing Materials.

Alvin J. Herzig has been elected president of the Climax Molybdenum Co. of Michigan, the research subsidiary of the Climax Molybdenum Co.

J. S. Beecher has been made a member of the technical department, power chemicals division, E. F. Drew & Co., New York, N. Y.

Thomas H. Pigford has been made assistant professor of chemical engineering at Massachusetts Institute of Technology, Cambridge.

John D. Cowan has been elected a vice president of West Virginia Pulp and Paper Co., New York.

Wilson T. Lundy has retired from his position as vice president of Freeport Sulphur Co., New York.

John S. Shaw has retired as director of safety of Hercules Powder Co., Wilmington.

Andre E. Briod has joined R. S. Aries & Associates, New York. He was formerly with Nopco Chemical Co.

John T. Cox, Jr. has joined the consulting practice of R. S. McBride and G. W. McBride, chemical engineers, in Washington D. C.

John W. Simpson has been appointed assistant engineering manager for the atomic power division of Westinghouse Electric Corp., Pittsburgh, Pa.

Clarence H. Endress has been made chief engineer of the Willard Storage Battery Co., Cleveland.

Jay S. Buckley, Kotaro Murai and Charles R. Stephens have been added to the chemical research staff of Chas. Pfizer and Co., Brooklyn, N. Y.

A. J. Passonno has been reelected president of Passonno Corp., Watervliet, N. Y.

C. C. Rausch has been appointed manager of rust preventive sales for the industrial department of Dearborn Chemical Co., Chicago. **J. G. Surchek** has been made assistant manager of all production and

maintenance. **E. M. Welch** has joined the Chicago office as manager of sales of water treatment and equipment. **A. H. Reynolds**, formerly directing chemist of the company's laboratories, has been made director, product development. **Wayne L. Denman** has succeeded Mr. Reynolds.

J. K. Beidler has been made assistant general manager, machinery division, Dravo Corp., Pittsburgh, Pa. **R. M. Rush** has been named manager of sales development. **H. M. Graham** has been made manager of the apparatus department; **D. R. Berg**, manager of the heating department; and **B. B. Reilly**, manager of air conditioning and combustion department.

Robert L. McFadin has been named manager of the merchandising sales department of the Marley Co., Kansas City, Kan.

George Zinzalian has been made sales manager of the technical products division, E. F. Drew & Co., New York.

Henry C. Carlson, former supervisor of the headquarters sales office for the chemical division of Koppers Co., Pittsburgh, has been named Midwest district sales manager for chemicals and plastics.

Herbert G. Kieswetter has been made assistant general manager of the mechanical goods division, United States Rubber Co., New York.

J. P. Cunningham has been appointed Chicago district manager of Shell Chemical Corp., New York. **J. G. Frye** has been appointed assistant to the sales manager, Eastern division.

H. M. Rich, Jr., has been appointed general sales manager of the electro metallurgical division of Union Carbide and Carbon Corp., New York

Creed W. Fulton has been elected a vice president and named manager of the New York office the Trundle Engineering Co., Cleveland. **Harry L. Wood** has been named to head its Chicago office.

Allen B. Harvey, formerly with Kerotest Mfg. Co., has been appointed eastern sales manager for refrigerants by Eston Chemicals, Inc., Los Angeles.

James D. Mahoney has been ap-

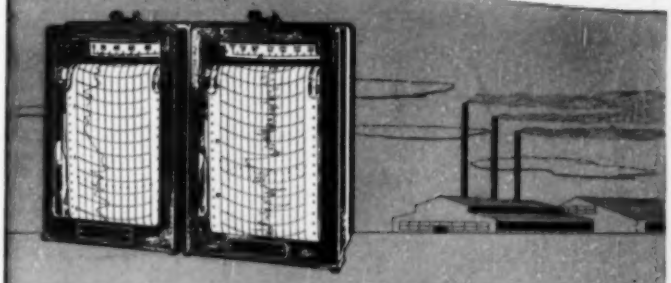
(Continued)

Have You a Contamination Problem?

Be alert to new ordinances governing the by-products of your factory processes. Use factual wind data in developing your plans for smoke and fume abatement. Bendix-Friez wind equipment, made by the manufacturers of the world's foremost meteorological instruments, is indispensable in studying the factors relating to your smoke and fuel control.

Aerodynamic transmitter is easy to install and modern in design.

Wind speed, wind direction permanently recorded indoors.



FRIEZ INSTRUMENT DIVISION
OF BENDIX AVIATION CORPORATION
Baltimore 4, Maryland

Bendix AVIATION CORPORATION

LAH* reduces carbon dioxide at room temperature and pressure!

Hydrides — industry's great new tools for synthesis and reduction — are making laboratory curiosities possible . . . **and practical!** For example, by using ethereal LAH (Lithium Aluminum Hydride) as a reagent, carbon dioxide is readily reduced to methylalcohol **at room temperature and pressure:**

$$\underset{\text{O=C=O}}{\text{CO}_2} + \text{LiAlH}_4 \rightarrow (CH_3O)_4\text{LiAl} \xrightarrow[H_2O]{HCl} CH_3OH + LiCl + AlCl_3$$

Ref: Nystrom, Yanko, Brown. J. Am. Soc., 70, 486-489 (1948)

Reductions of this type ordinarily do not act on olefinic double bonds and require only equipment normally available. Several users are now performing reductions on a commercial scale with LAH* available from Metal Hydrides Inc.

* (Lithium Aluminum Hydride)

Metal Hydrides Inc. is a pioneer in the production of Hydrides on a commercial scale. These highly reactive, diversified compounds, are now available in powdered or lump form as Hydrides of Titanium, Zirconium, Tantalum, Sodium, Barium and Calcium.

Manufacturers in dozens of fields are using one or more of these Hydrides in faster and more economical methods of reduction and condensation. Chances are there are jobs in your plant these reagents can do better — and at less cost. It costs nothing to find out and your problem will be treated confidentially. Write today!

HYDRIDES of TITANIUM ZIRCONIUM, TANTALUM, SODIUM BARIUM and CALCIUM

METAL HYDRIDES INC.
P. O. BOX 483
BEVERLY, MASS.

Names in the News, cont. . .

pointed sales development manager for the Merrimac division of Monsanto Chemical Co., St. Louis, Mo.

William A. Delger has been made vice president in charge of manufacturing for the DeVilbiss Co., Toledo, Ohio. **Don J. Peeps** has been made vice president in charge of engineering.

Joseph W. Bouknight, associate professor of chemistry at the University of South Carolina, has been elected chairman of the South Carolina section of the American Chemical Society.

Seton Porter, chairman of the board of National Distillers, has been appointed a member of the executive committee of the board of directors of General Aniline & Film Corp., New York.

Donald H. Waddington has been added to the sales staff of the Atlanta office of the Bridgeport Brass Co., Bridgeport, Conn.

J. R. Herd has been appointed sales manager of Armour and Co.'s household soap division. **A. L. Hare** succeeds Mr. Herd as general plant sales manager.

H. R. Holmyard has been named assistant to the director of merchandising, Owens-Corning Fiberglas Corp., Toledo, Ohio.

J. E. Swearingen has been made central division manager for Stanolind Oil and Gas Co., Tulsa, Okla. **Donald G. Zink** has been named general superintendent, chemical products department. Lawrence L. Smith has been made superintendent of the Brownsville, Tex., chemical plant.

Harold Duncan has been named assistant regional manager in the Southwest for Eutectic Welding Alloys Corp., New York, N. Y.

William A. Streaker has joined Atlas Mineral Products Co. as a chemical engineer.

J. W. Northcutt has been appointed Atlanta district sales manager for Rockwell Mfg. Co., Pittsburgh, Pa. He succeeds **C. C. Moore** who has been transferred to Columbus, Ohio.

W. B. Dunwoody has been appointed project engineer for the Mississippi Chemical Corp. at its new fertilizer

plant to be located at Yazoo City, Miss. He was formerly with Universal Engineering Corp.

Robert B. Colgate has been elected a director of the American Car and Foundry Co., New York.

Elmer C. Otto has retired as vice president of Chas. Pfizer & Co., Brooklyn, N. Y.

Delbert E. Jack has resigned as vice president in charge of engineering and sales for the Duriron Co., Inc. He will return to California to establish his own company as manufacturers agent. He retains his current position on the board of directors of the Duriron Co. and will also be their West Coast technical director.

George G. Bull has been made manager of trade sales laboratories, Standard Varnish Works, New York.

Harry Collyer has been appointed laboratory director of Cabot Carbon Ltd., Ellesmere Port, England. He was formerly in charge of rubber and plastics testing and technical service at the Boston research and development department of Godfrey L. Cabot, Inc., Boston.

David W. Jones, Jr., has been named to represent Lukens Steel Co. and its division in the sale of steel plate and specialty plate products in the Rocky Mountain area.

R. E. Barnett has been appointed assistant sales manager of Marsh Instrument Co., Skokie, Ill.

Harry S Thompson has been appointed supervisor of the new beta naphthol plant of the Hilton-Davis Chemical Co. division of Sterling Drug Inc. The plant is located in Cincinnati.

J. Frank Greeley has been promoted from sales manager to general manager of the multiwall paper bag division of Fulton Bag & Cotton Mills, New Orleans. He succeeds **Fred E. Goss** who resigned as manager. **J. A. Mundie**, with Fulton at Dallas, is moving to New Orleans to assist Mr. Greeley.

A. K. Hamilton has been made vice president of Commercial Solvents Corp., New York.

P. D. Mellon, Calgary, Canada, has been appointed representative for the Fluor Corp., Ltd., Los Angeles.

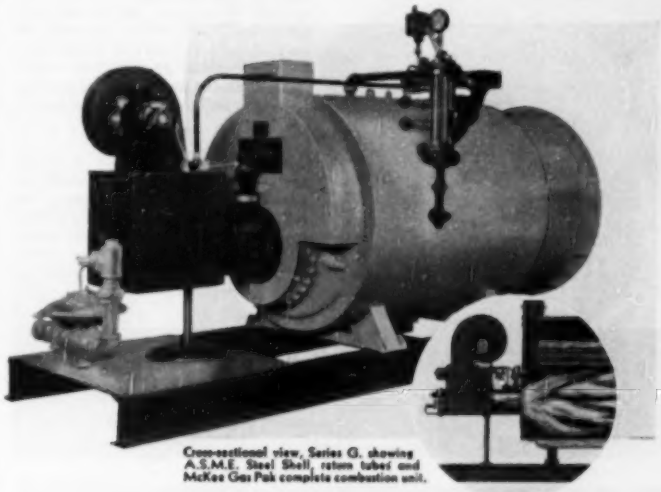
(*Continued*)

McKee Eclipse

ANNOUNCES *New Series*

McKEE automatic gas-fired

SCOTCH STEAM PAK



Cross-sectional view, Series G, showing A.S.M.E. Steel Shell, return tubes and McKee Gas Pak complete combustion unit.

12 Years Field Experience

This McKee Automatic Gas-Fired Scotch Steam Pak is much more than just another "package boiler", as its history proves.

In 1937 the Eclipse Fuel Engineering Co., which at that time had more than a quarter century of experience as makers of the famous McKee-Eclipse Automatic Gas-Fired Vertical boilers, sensed a widespread need for a complete "steam-boilerplant" So we built and placed into operation a number of horizontal internal furnace boilers, which incorporated what we had found are the 19 requirements of a good boiler.

Every one of these boilers is in successful operation today. They are in various localities, using all kinds of water and all kinds of gas, for many different applications—chemical plants, bakeries, dairies, creameries, laundries, industrial plants, churches, etc.

McKee Automatic Gas Fired Scotch Steam Pak Boilers are built in nine different sizes, 12 to 100 H.P., in strict accordance with the latest requirements of the A.S.M.E. Boiler construction codes.

Write for new descriptive bulletin A-104 or get in touch with your nearest McKee Eclipse representative.

Representatives in principal cities

Eclipse Fuel Engineering Company

721 S. MAIN STREET ROCKFORD, ILLINOIS

McKee Eclipse

FILTER UNITS *by* MULTI-METAL

This large sump strainer basket, of heavy copper mesh trimmed with heavy angle iron rings, is another example of Multi-Metal's all-round ability to design and fabricate complete wire and filter cloth units. It is only one of hundreds of Multi-Metal fabricated units setting outstanding performance records throughout the processing industries. This is to be expected of Multi-Metal's 35 years of production and application of wire and filter cloth units for improving processing efficiency and reducing maintenance costs.

Multi-Metal has available a large variety of filter and wire cloth of all meshes, weaves and metals — by the yard, piece or roll. Write today for wire cloth samples and useful Multi-Metal catalog on wire cloth. Send along your prints and specs for prompt quotations.

More than 35 years of service to process industries

Multi-Metal
WIRE CLOTH COMPANY, INC.
1350 Garrison Ave., New York 59, N. Y.

it's profitable

TO TALK PUMPS WITH YOUR WEINMAN REPRESENTATIVE

Class B Non-Clogging flexibly coupled units for handling liquids carrying solids and stringy trash

for help on ANY pumping problem, write, wire or phone a Centrifugal Specialist... your WEINMAN representative

When you and your WEINMAN representative talk pumps, it's mutually profitable. You pose the liquid handling problems; he comes up with the solution. WEINMAN pumps are in daily use in chemical processing plants from coast to coast. Their design, application and installation are the sole concern of the WEINMAN organization. WEINMAN makes ONE product—pumps . . . with ONE purpose—to do your job most profitably.

Built by Centrifugal Specialists
The WEINMAN Pump Mfg. Co.
300 SPRUCE STREET • COLUMBUS 8 • OHIO

NAMES IN THE NEWS, cont. . .

G. H. Dieter has been made general sales manager in Los Angeles; **R. E. Nagel** has been made assistant sales manager in charge of the Chicago sales office.

Vernon F. Daughney has joined the staff of the mineral dressing laboratory of American Cyanamid Co., at Stamford, Conn.

Frederick J. Mayo and Donald W. Neville, vice presidents of F. H. McGraw & Co., New York, have been elected directors.

Sanford M. Wagner has been elected vice president in charge of sales for Ethyl Corp., New York.

Cleveland Lane has been made manager of the newly-formed public relations division of Pennsylvania Salt Mfg. Co., Philadelphia.

William H. Winfield has been made assistant to the president of Monsanto Chemical Co., St. Louis, Mo. He was formerly manager of the economic research department.

James A. Ford, sales manager of Jerguson Gage & Valve Co., Somerville, Mass., has been elected vice president and director.

Roy B. Johns has been elected a vice president of Freeport Sulphur Co., New York.

Curtis W. Howard has been made general factories manager of the Kaylo division of Owens-Illinois Glass Co., Toledo, Ohio.

Philip L. Slayton has been appointed Merrimac division sales representative for Monsanto Chemical Co.'s Chicago office.

Arthur Hunter has been transferred to New York as assistant general sales manager of Combustion Engineering-Superheater, Inc., New York.

G. E. Kadisch has been appointed vice president and general manager of General Ceramics and Steatite Corp., Keasbey, N. J.

F. Faxon Ogden has joined the general development department of Monsanto Chemical Co., St. Louis, Mo. He was formerly sales development manager for the Merrimac division in Everett, Mass.

Herbert W. Yeagley has been appointed Washington, D. C., repre-

sentative of Monsanto Chemical Co., St. Louis, Mo. **C. F. Trombley** has been made general branch manager of the western division's San Francisco office. **A. W. Hempelmann** has succeeded him as branch manager at Seattle.

C. Mason Gerhart has been transferred to the home office of the York Corp., Houston, Tex.

G. Kenneth Fisher has been made a general partner of Sheffler-Gross Co., Philadelphia.

J. C. Kemp has been appointed district manager of the Chicago office of Ampco Metal, Inc., Milwaukee.

W. Church Holmes has joined the staff of Nichols Engineering Corp., New York, as manager of the special engineering contracts division of the mining and metallurgical department.

H. G. Batcheller has been elected chairman of the board of Allegheny Ludlum Steel Corp., Pittsburgh, Pa. **E. B. Cleborne** has succeeded him as president.

Morris R. Stanley has been made director of sales of Victor Chemical Works, Chicago.

Rafael Ponciano has been transferred to Refinacoes de Milho Brazil, Sao Paulo, Brazil. It is a subsidiary plant of Corn Products Co.

OBITUARIES

Peter Siegman, 75, a chemist at Abbott Laboratories, Inc., North Chicago, Ill., died in Waukegan, Ill., December 27.

Clifford D. Prickett, 86, former vice president and director of Hercules Powder Co., Wilmington, died in Wilmington December 29.

Hugo Bamberger, 62, died in New York December 30. He was president of the Chemo-Puro Mfg. Corp., of Long Island City.

Emerson H. Fairchild, 59, died at his home in Cleveland, January 1. He was a veteran in the materials handling industry.

Howard C. Hatch, 42, chief chemist of the Chatham Manufacture Co., died at his home in Elkin, N. C., January 2.

H. O. Brumder, 69, president of Pressed Steel Tank Co., Milwaukee, died in Milwaukee, January 4.

***Only* 3 MOVING PARTS *in the* HENSZEY *Indicating* FLOW METER**

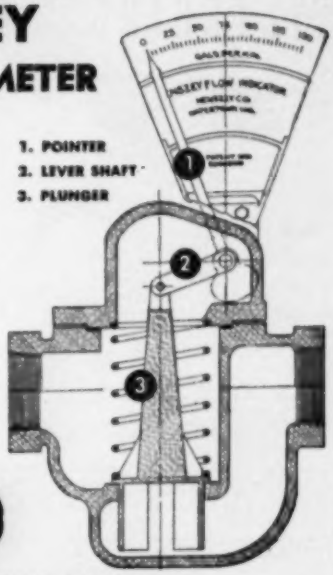
Only three moving parts—the Pointer, the Lever Shaft and the Plunger. That means continued service and CONSTANT ACCURACY.

The liquid enters below the plunger, forcing it upward and exposing more area of the metering slots so that the motion is in direct proportion to the flow.

The graduations on the dial are uniformly spaced from one end to another and read direct—without constants. The meter is installed right in the pipe line.

Send for Bulletin FI-1

HENSZEY COMPANY
Dept. E2, WATERTOWN, WISCONSIN



HENSZEY

***Indicating* FLOW METERS**

Continuous Blowdown • Distillation Systems • Heat Exchangers
Feed Water Meters • Boiler Feed Regulators • Proportioning Valves
also MILK EVAPORATORS and PRE-HEATER

Now! GET ALL LEATHER GLOVES WITH
SEAMS THAT DEFY ACID

1. BETTER BECAUSE they're sewn with acid resistant thread.
2. BETTER BECAUSE they're made of smooth, all leather side horsehide.
3. BETTER BECAUSE no fiberous leather lint to contaminate chemicals.
4. BETTER BECAUSE seams won't give away to acid, assuring full life to the glove as in the leather itself.
5. PROVEN BETTER by 20% to 30% by one of America's foremost chemical manufacturers.

Other gloves available besides side horsehide. If you've a particular glove problem write, Illinois' "Special Glove Department" stating fully your needs. We are equipped to make gloves to fill the most exacting specifications.

It's revolutionary . . . a glove with seams that will last as long as the leather itself because they're sewn with acid resistant thread. Banish forever that costly habit of discarding gloves before they're worn out. Get all the wear from every pair.

ILLINOIS GLOVE CO
CHAMPAIGN, ILL

WRITE FOR SAMPLES

If your problem is

FILTERING...

"Best Sand Filter made!"

Here is a sand filter which cleans itself—automatically—with no interruption whatever to the filtering operation. No shut-down or change-over is necessary while cleaning is in progress. Capacities range from 100 gallons per minute to 3000 gallons per minute.

The secret lies in its special, compartmented filter bed and traveling backwash mechanism which automatically cleans and removes the sludge from one compartment at a time—on a pre-determined time cycle or with increase in head pressure.

Can also be used in filtering waste water for return to the process. Write for Bulletin 46-11.

HARDINGE

Positive Contact Plugs and Jacks permit 80 thermocouples, regardless of location, to be selected and switched to any of 80 Pyrometer recording points. When your thermocouple circuits require flexibility of connections or arm-length control, let us help you.

Send for Panel Bulletin 21E

Thermo ELECTRIC CO.
FAIR LAWN N.J.

INDUSTRIAL NOTES

NEW FACILITIES

Sterling-Winthrop Research Institute, Rensselaer, N. Y. – A laboratory building to house all research activities. It is located on Columbia Turnpike.

Esch-Conduit, Inc., Houston–Sales offices in Tulsa, Okla., and El Paso and Beaumont, Tex. Heading the offices are Frank L. Mill, George Krutilek and Robert L. Hearn, Jr., respectively.

United States Testing Co., Hoboken, N. J.–An additional research division in Boston as a result of a merger with Esselen Research Corp.

O. G. Kelley & Co., Boston–A plant and office at 12314 Elmwood Ave., Cleveland. The plant will fabricate stainless steel, lead, wood and steel equipment for the chemical process industries.

Combustion Engineering – Superheater, Inc., New York–A western division with headquarters in Los Angeles and branch offices in San Francisco and Seattle. Robert M. Hatfield, Jr., has been named general manager.

Townotor Corp., Cleveland–Factory sales and service branch in Oakland, Calif. Gordon Winters has been put in charge.

Joseph T. Ryerson & Son, Chicago–A building to warehouse bar and sheet steel and tubular steel products and to provide additional office space.

Hercules Powder Co., Wilmington–An expanded Dallas office for its naval stores department. The office will handle sales of turpentine, pine oil, rosin and rosin and resin derivatives in addition to toxaphene.

NEW REPRESENTATIVES

Van Buren Machine Works has given Houchin Machinery Co., Hawthorne, N. J., exclusive world-wide distribution rights for Van Buren automatic soap wrapping and cutting machines.

Conoflow Corp., Philadelphia, has named two district sales representatives: J. V. Tripoli & Co., Buffalo, N. Y., and E. Roy Myers Co., Cincinnati, Ohio.

Alan Plastics Corp., Irvington, N. J., and **Gruenberg Electric Co.,** Brooklyn, N. Y., have appointed J. W. Leser Co., Los Angeles, their exclusive California representative.

Goodyear Tire & Rubber Co.'s chemical division has made Hayes Adhesives Co., St. Louis, Mo., a distributor of its all-purpose adhesive.

Graver Water Conditioning Co., New York, has appointed the following sales engineering representatives: Brookman-Kron Associates, Buffalo, N. Y.; J. R. Fortune & Son, Detroit; Stapp Engineering Co., Denver; Process Equipment Co., Tulsa, Okla.

Pennsylvania Crusher Co., Philadelphia, has appointed the following sales representatives: Leatherman and Mertz, Detroit; Swaney Co., Newtonville, Mass.; Stanley B. Troyer, Crosby, Minn.; Wharton L. Peters Machinery Co., St. Louis, Mo.

Andreas Hofer, Muelheim-Ruhr, Germany, has appointed ChemTech Products Corp., New York, to handle sales of its high pressure equipment in the United States.

Electro Chemical Supply & Engineering Co., Emmaus, Pa., has named H. D. Fowler Co., Seattle, Wash., as its agent in the Northwest.

NEW COMPANIES

Sharp & Dohme Interamerican Corp. to transact all Sharp & Dohme export business in Puerto Rico and Argentina. W. B. Wimpenney has been made president.

Leon Jasper, New York, to buy and sell new and used equipment for the food, drug, chemical and allied industries. Offices are at 1123 Broadway.

Nelson Stud Welding Co. of Canada, Ltd., Toronto, to supply the Canadian market with studs and special purpose fasteners formerly supplied by the Nelson stud welding division of Morton Gregory Corp., Lorain, Ohio.

Charnley Laboratories, Vancouver, B. C., to supply chemical and statistical analysis and consultation on fish, feeds, fertilizers, agricultural

(*Continued*)

NEW RICE BRAN PLANT.... ALLIS-CHALMERS EQUIPPED

YES — HERE'S THE NEWEST in continuous solvent extraction plants . . . the first of its kind in the world. Engineered and equipped by Allis-Chalmers for American Rice Growers Co-operative Association in Houston, Texas, this 50 ton rice bran mill is now in operation.

A-C SYSTEM PRODUCES OUTSTANDING RESULTS

Four definite advantages resulting from this solvent extraction process have been apparent right from the start. 1) An edible and salable vegetable oil — in quantities to 7½ tons per day — has been produced from freshly milled rice bran . . . 2) Extracted meal is in great demand as a livestock feed because it has higher protein content than raw bran . . . 3) Extracted bran can be kept indefinitely without danger of turning rancid . . . 4) Wax removed from rice bran by solvent extraction process, and now being lab-tested, may prove to be valuable by-product.

These are the straight facts on a new solvent extraction product — milled rice bran. And Allis-Chalmers has sound, factual information on other vegetable oil products, too — such as soybeans, cottonseed and corn germ . . . products in which A-C has pioneered. Why not discuss *your* solvent extraction possibilities with one of our friendly district office men. There's no obligation.

ALLIS-CHALMERS

Pioneers in the Field of Continuous Solvent Extraction

Send this handy coupon for illustrated 20-page bulletin and other information on the Allis-Chalmers continuous solvent extraction system.

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MILWAUKEE, WIS.

☐ Please send solvent extraction bulletin 1386757A.

☐ Am interested in information on solvent extraction of.....

☐ Please send A-C representative.

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Title.....

Firm.....

Address.....

City..... State.....

A-2907

Shaft Packing No Chemical Can Attack

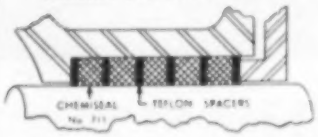
Teflon "Chemiseal" #711 Packing Stays in Service Months Where Other Packings Failed in Hours

"We've got a pump handling hypochlorites," a paper manufacturer told us, "and we can't find a packing that will last more than 5 hours." So we sent him a set of Chemiseal #711. It went into continuous service in November. It's still in there and going strong months later.

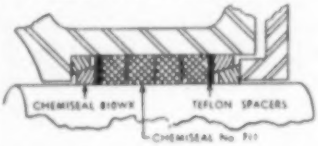
A steel plant tried a #711 packing last summer on a pump handling coke liquor. Recently they ordered #711 for 40 more pumps.

There are hundreds of similar cases in our files.

CHEMISEAL #711 SHAFT PACKING



CHEMISEAL #711WX SHAFT PACKING



No chemical — acid, solvent, caustic, oil or gas—can attack or dissolve a Teflon Chemiseal #711 or #711WX packing. "Chemiseal" non-corroding, non-contaminating, heat-resisting gaskets, packings, adapters and expansion joints can save you hundreds of dollars and countless production delays.

Phone, write or bring your gasket and packing problems to —

UNITED STATES GASKET CO.

628 N. 10th Street
Camden, New Jersey

INDUSTRIAL NOTES, cont. . .

products, minerals and other industrial goods. The laboratories will be headed by Frank Charnley, formerly in charge of the Federal Fisheries Department in Vancouver.

American Monomer Corp., Boston, to provide industrial and chemical research groups with a central source of supply for specialty monomers. Some of the the monomers are glacial acrylic acid, diallyl adipate, cyclohexyl methacrylate.

Champion Glove Corp., Brooklyn, N. Y., to manufacture plastic coated industrial work gloves. A special department has been set up to coat wire, metal parts, cord, belting and tools with plastic. Louis K. Braunston is president of the firm.

NEW NAMES

Permanente Products Co., Oakland, Calif., to Kaiser Aluminum & Chemical Sales, Inc.

Emeryville Chemical Co., Emeryville, Calif., to Diamond Alkali Co. of California. A silicate of soda plant, it will continue as a wholly-owned subsidiary of Diamond Alkali Co., Cleveland.

Distillation Products, Inc. to Distillation Products Industries, division of Eastman Kodak Co. The new division, formerly a wholly-owned subsidiary of Eastman Kodak, will be located in Rochester, N. Y.

NEW LOCATIONS

Swift & Co.'s industrial oil division has moved from Chicago to 165th St. and Indianapolis Blvd., Hammond, Ind.

Glyco Products Co. of Brooklyn, N. Y., and Natrium, W. Va., has moved its offices to the Tribune Tower Bldg., Chicago.

R. D. Travers Co., Canadian representatives for Cambridge Wire Cloth Co., has moved to 117 Charlton Ave., West Hamilton, Ontario.

Dorr Co. has moved its general offices to Barry Place, Stamford, Conn. A branch office will be continued at the former headquarters at 570 Lexington Ave., New York.

Macbeth Corp., has moved all its activities to its new plant at Newburgh, N. Y. It was formerly located in New York.

—*End*

1950 RESOLUTION:

Save!

You *Will*, too . . . With

ANTHRAFILT*

(The Hard Coal Filter Medium)

ANTHRAFILT*—a hard coal filter medium that will save you money regardless of whether you filter acetic, and sulphuric acid, or caustic soda solutions, boiler condensate, sanitary or process water—is a must!

Essentially a carbon containing a small percentage of mineral ash, it provides:

- √ **GREATER CAPACITY**
- √ **LONGER FILTER RUNS**
- √ **CLEANER WASHINGS AT LOWER COST**
- √ **REMOVES ENTRAINED TURBIDITY FROM INDUSTRIAL PROCESS SOLUTIONS OR WASTES**

Since practically all minerals other than the inherent ash have been removed during preparation, by thorough washing, no water soluble constituents remain to contaminate, or contribute tastes or odors to filtered solutions.

You are invited to write us today for full details and recommendations

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Smooth, Vibrationless

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FOSTER WHEELER indirect heating equipment plays an important part in a special process developed by the Plastic Film Corporation. Indirect heating with Dowtherm makes it possible to expose film to air at a high temperature (475 F) for drying or other conditioning without risk of fire or spoilage.

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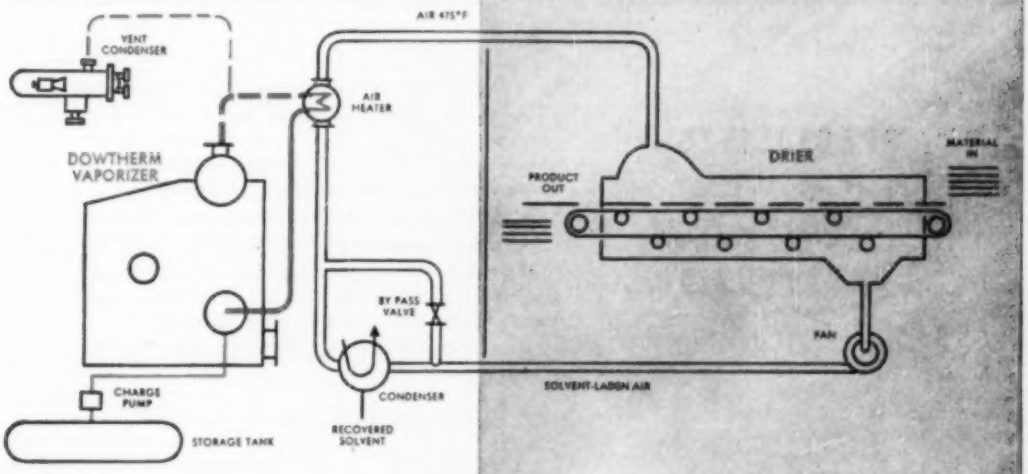

Flow diagram of
Foster Wheeler Dowtherm Heated Process System
employed by the Plastic Film Corporation

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Quotes, Extracts and Digests

Water

(Continued from p. 131)

water is added at the end of the washing cycle and progressively washes materials containing larger and larger amounts of foreign matter. In wool scouring the overflow water from the rinsing bowl is returned to the first bowl in the sequence, where the wool enters. Here, detergents are added and the water reused.

Such operations yield relatively small volumes of waste water containing high concentrations of impurities. The method has definite advantages over uniform concentrations in wash waters maintained by blowdown with corresponding makeup.

Often, water used in washing or as a carrier for sand, wood pulp, crumb rubber and so forth, is unfit for re-use without intermediate treatment. This may be effected by gravity separators equipped for removal of solids both lighter and heavier than water; by filters, by thickeners, by sludge blanket units and many other devices. Coagulating or other chemicals may or may not be necessary. Often slime control by addition of chlorine or chloramines must be used when water is repeatedly re-used. Not only do these methods save water, but they promote recovery of valuable constituents in waste waters for re-use or sale.

COOLING TOWERS

Generally, the largest single use of water by industries is for cooling purposes. The volume and the temperature of the cooling supply are of the greatest importance and can be specifically evaluated on a dollar basis. These requirements take precedence over the quality of the supply, and rightly so. However, water quality cannot be ignored, especially when dissolved salts, gases or byproducts present adversely affect heat exchange equipment. Irrespective of the motives prompting the installation of cooling towers, these devices are among our greatest contributors to water conservation.

The temperature of water in intimate contact with air will closely approximate the wet bulb temperature of the latter. Many cooling towers are designed to cool the water to within 10 deg. F. of this temperature. Under some conditions, a closer approach to the wet bulb temperature is necessary. To meet such requirements, towers are designed to cool the water to 5 deg. F. above the wet bulb temperature.

By the evaporation of 1 percent of the circulated water, a reduction in temperature of 10 deg. can be achieved. To this loss, windage—usually less than 1 percent—and blowdown must be added. The sum of these three losses represents the total make-up water which must be supplied to cooling towers.

Make-up requirement usually is of the order of 5 percent, thus conserving 95 percent of the quantity of water used in a once-through cooling water system. This method of conserving water is not without penalties, since the makeup water must be treated and deposition of encrusting solids must be controlled.

Water recirculated over towers is always saturated with dissolved oxygen, carbon dioxide and other gases, and is generally quite corrosive. However, suitable measures for preventing excessive scaling or corrosion are well known and may be applied. The recirculated water can be adjusted chemically so that a thin, dense protective carbonate scale is formed which prevents contact of water with metal, but does not interfere seriously with heat transfer. Also, chromates and organic compounds are employed to protect metals from the aggressiveness of the recirculated water.

Where plant conditions require water of different temperatures for various processing this can be effected by mixing the different supplies, by the selective use of cold well water, by recirculation over towers, or by selective refrigeration.

Sheppard T. Powell and A. Chesley Wilson before the Fifth Industrial Waste Conference, Purdue University, Lafayette, Ind., Nov. 29 and 30, 1949.

INDUSTRY

. . . Professional Competence

Brehon Somervell

What industry wants first of all in engineers is professional competence. We hear a lot today about engineers in other activities and it is quite true engineers must be qualified in these other things.

Engineers have changed the face of the whole world. Much of it in our lifetime. They didn't do that by being experts and sociologists, they did that by knowing their stuff as engineers. That is something that we don't want to lose sight of in these many other problems that we have to talk about.

Brehon Somervell, Koppers Co., before a panel session, 125th anniversary celebration, Rensselaer Polytechnic Institute, Troy, N. Y., Oct. 14, 1949.

THE OLD OIL

"There is good historical evidence to show that oil was being produced, refined and sold at the town of Oil Springs from 1857 on. If one accepts this evidence, Canadian oil production preceded the famous Drake discovery well in Pennsylvania by some two years.

M. L. Haider, ***Director Imperial Oil Limited***

NUCLEONICS

. . . A New Reactor

Lawrence R. Hafstad

We are getting a glimpse of the nature of a new front opening up in the campaign for reactor development. The problem of fuel reprocessing is an enormous one, and it is almost entirely a chemical engineering problem. The cost of this processing is so high that, even if all other costs in the reactor business were kept low, it alone might keep power derived from nuclear reactors from competing economically with other fuels. It pains me as an engineer to see carefully fabricated and machined parts, products of many man-hours of highly skilled work, casually dissolved in acid to start the chemical purification. This procedure is even more painful to chemical engineers, so they have been suggesting reactor designs in which the laborious fuel element fabrication step can be eliminated either by placing the fuel in a solution or by utilizing techniques of transporting fluidized solids.

From such thinking there emerges the possibility of a new kind of reactor called the homogeneous reactor. All reactors constructed so far, except for one small experimental unit, have been built upon the principle of embedding fuel elements in other materials used for cooling, reflecting, and moderating. The question has been studied and restudied from time to time to see whether it would be

(Continued)

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The majority of industrial pressure control applications and many temperature applications can be satisfactorily handled by a simple pneumatic proportional controller with narrow-to-intermediate proportional band setting. Models 2700 Pressure and 3700 Temperature Controllers have been designed to meet these requirements at moderate cost without sacrifice of performance, precise proportional response or ease of adjustment.

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QED, *cont. . .*

feasible and practical to make a reactor in which these constituents are mixed together uniformly; hence the term "homogeneous reactor."

The homogeneous reactor, in its various conceivable forms, opens up entirely new vistas and areas of development in the field of reactor design. It is my belief that with experience from the first four reactors under our belts we should be in a position to attack this difficult new design and this new type will constitute a large part of the next crop of reactors. Obviously, chemical engineering must contribute heavily. We must come to grips with the fuel reprocessing problems involved in the operation of the first four reactors, and begin to take advantage of the opportunities which exist in the "homogeneous" design.

Lawrence R. Hafstad, U. S. Atomic Energy Commission, before the American Institute of Chemical Engineers, Pittsburgh, Dec. 6, 1949.

PROTECTIVE COATINGS

. . . *Paint Principles*

U. R. Evans

Oil paints will probably be used in the protection of steel for many years to come. The idea that the protection depends mainly on the exclusion of moisture or acid fumes from the steel is probably wrong; many efficient coatings are very porous. It is generally agreed that protection is best achieved if the priming coat contains an inhibitive pigment, the outer coats being chosen to prevent mechanical or chemical deterioration of the primer.

Some other types of covering provide coats less pervious than layers of oil paint, but appear to be less suitable as vehicles for inhibitive pigments, such as red lead. Probably the true inhibitor in red lead paints is not red lead itself, but lead linoleate, or some other lead soap, formed by interaction with the drying oil; in certain media, soap will not be formed at all, and the inhibition will fail. The mechanism of inhibition is, however, a complicated one.

RESEARCH . . .

"A company without a program for technological betterment is a poor risk. The most conservative attitude toward profits today is a policy of deliberate risk-taking. The biggest gamble is to do no research at all."

EDGAR A. JEFF II, *Assistant Director*
Armour Research Foundation

Numerous exposure tests agree in showing that even a good painting system gives inferior results if applied to an unclean surface. An inhibitive primer may fail to passivate steel if it is separated from the metal by a layer of rust or broken mill scale. Tests have indicated that protection is least effective if paint is applied at a stage when the greater part of the surface is still covered with mill scale, broken up by small patches of rust. This combination of large cathode (the scale) and small anode (the scale-free iron) leads to considerable corrosion. Fresh rust formed under atmospheric conditions is largely formed below the paint; being more voluminous than the steel, the paint is pushed away from the surface, with disastrous results. Under immersed conditions, the rust is largely precipitated outside the paint, and the breakdown due to rust is less serious; nevertheless, in stagnant salt water, alkali, the cathodic product, may accumulate at the regions most accessible to oxygen and loosen the paint.

Although the oxide on cast iron, cast steel and certain types of wrought iron can with advantage be left in position before painting, it is desirable that rolled steel work should be freed from scale and rust before paint is applied.

U. R. Evans, University of Cambridge, before the United Nations Scientific Conference on the Conservation and Utilization of Resources, Lake Success, Sept. 1, 1949.

HEAT TRANSFER

. . . *Unsolved Problems*

W. H. McAdams

The mechanism of conduction on homogenous solids systems is well established, and a number of problems have been solved recently by analytical methods. However new and better methods must be developed for the answers to the problems of conduction.

Future experimental work should involve measurement of physical properties of present materials over wider ranges of conditions, and of new materials which will be developed in the future. It will be necessary to devise

(Continued)

. . . COSTS

"Research has long done a fine job in studying the costs of operations of all sorts, but the time has come when it must give some attention to cutting its own costs."

ROBERT E. WILSON, *Chairman of Board Standard Oil Co. (Indiana)*

No. 3TH MIKRO-PULVERIZER in plant of large manufacturer of cellulose acetate pulp. Large feed hopper is charged from floor above. Mill discharges into storage bin on floor below.

Let us show you how others have effected economies and improved their finished product through the use of MIKRO grinding and dust collecting equipment specially designed for the Chemical Processing Industry.

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If you have a pulverizing or dust control problem, our engineers will study it, telling you what our equipment and the MIKRO-Plan can do for you. There is no charge for this service which is based upon thousands of tests and performance records.

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MIKRO-PULVERIZER (FINE) **-ATOMIZER** (ULTRA FINE)
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VIKING *Rotary* PUMPS

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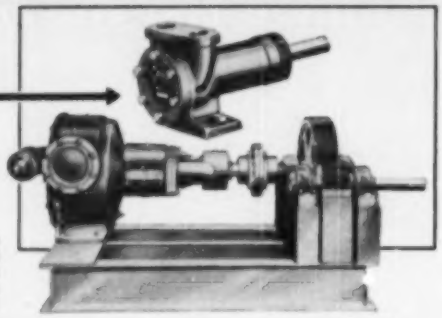
TO 1050 GPM



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QED, cont. . .

methods of measuring thermal conductivities at temperatures up to 5,000 deg. F. Further study of the mechanism of heat transfer in porous solids seems warranted, because of the internal transfer by conduction, radiation and convection.

Transfer of heat by radiation between surfaces in transport media now is on a sound mathematical basis. In the combustion of fuels with preheated air in industrial furnaces at high temperatures, various chemical compounds of unknown radiating characteristics are formed. Because the flame temperature on which reaction rates and the nature of the products depend is controlled by heat transfer, further studies on such systems seem imperative. Gas radiation data for steam and carbon dioxide are limited to low pressures, and the effect of high pressures should be determined. In a number of applications fuels are now burned with oxygen-enriched air or oxygen instead of air. The emissivities of surface and combustion products are needed at unusually high temperatures to deal with such problems.

With heat transfer from a solid to a fluid the situation is far more complex, both conduction and convection are involved, and heat transfer has a complicating effect on the mechanism of fluid flow which is not fully evaluated. Various methods of attack include mathematical analogies between transport of heat and momentum, and of heat and mass. For many cases, where theory is inadequate, remarkable success has been attained in correlating data in terms of well chosen dimensionless groups of the pertinent factors, thus substantially reducing the number of variables. The greatest progress has been made in measuring and correlating local or point coefficients of heat transfer.

In the field of conventional heat transfer, unsolved problems remain. For example, in the condensation of a vapor from a non-condensible gas, data are available only for steam and air at atmospheric pressure, no data are available for dehumidifying a mixture of various vapors and non-condensible gases. Promoters have been found to render certain metals nonwettable toward condensed steam, thereby producing drop-wise conden-

---

OF CORSET HAS

"Big government has definitely bulged over into the economic life of this nation."

EARL BUNTING, *Managing Director National Association of Manufacturers*

CONTINUED INCUBATION

"The atomic age is being kept in the infant stage by the far-reaching effects of nuclear misinformation."

J. J. Bulloff
Associated Colleges of Upper New York

sation which gives much higher coefficients of heat transfer than does film-type condensation.

Novel applications of heat transfer between surfaces and fluids involve both conventional and unconventional heat-transfer fluids, frequently with unusually high density of heat flux and high temperature level. Such conditions are beyond the range of existing empirical equations, and lack of fundamental data on velocity and temperature fields causes substantial uncertainty in the reliability of the theoretical relations. Consequently, much remains to be done in collecting data for the new conditions, including physical properties of many heat transfer media. Further work is needed for forced convection at very high gas velocities.

William H. McAdams, Massachusetts Institute of Technology, before the American Institute of Chemical Engineers, Pittsburgh, Dec. 5, 1949.

OVERPRODUCTION

. . . *Research*

C. F. Rassweiler

American industry may be approaching over-production in a new field—research.

The day is past when a research organization could proceed with the assurance that any findings offering possibilities of satisfactory profits would be commercialized and used.

Research is becoming more and more expensive. Present economic and tax trends have threatened the availability of venture capital, and the rate at which research results are being secured has, in some cases, exceeded the absorptive ability of companies and even whole industries.

It has become increasingly important, therefore, that not only research planning but also the actual conduct of research investigation should be closely geared to market needs, the potential availability of capital funds, and the company's long-range planning.

This involves a great deal more than a willingness on the part of the research people to seek advice from the rest of the company. It is extremely difficult for even the most intelligent and progressive-minded management to determine in advance what a com-

(Continued)

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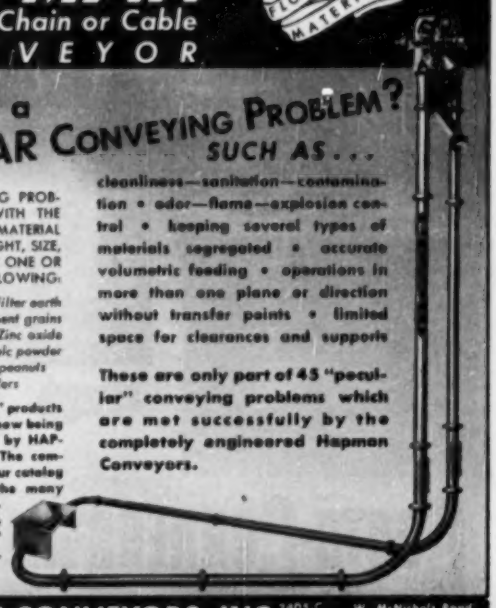
The above "flowable" products and many others are now being handled successfully by HAPMAN CONVEYORS. The complete list is given in our catalog which shows also the many ways Hapman Conveyors can be used to help solve "peculiar" conveying problems.

cleanliness—sanitation—contamination • odor—flame—explosion control • keeping several types of materials segregated • accurate volumetric feeding • operations in more than one plane or direction without transfer points • limited space for clearances and supports

These are only part of 45 "peculiar" conveying problems which are met successfully by the completely engineered Hapman Conveyors.



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That's one job we know, inside-out. For almost a century, we've been air-and-gas specialists, exclusively. Without being immodest, we think our engineers are the best informed in the industry, on blowers, exhausters, gas pumps and related equipment.

They have an extensive line to draw on, too. They make unbiased recommendations between Centrifugals and Rotary Positives—we're the only company offering this *dual choice*. With capacities ranging from 5 cfm to 100,000 cfm, we can supply standard units closely matched to the job, for efficiency and economy.

As to how R-C equipment performs, our old-time, repeat customers are the best answer to that. They'll testify that you will reduce your buying and operating problems when you call on R-C air-and-gas specialists.

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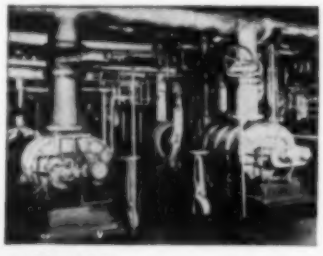
502 Illinois Avenue, Connersville, Indiana

CENTRIFUGAL

Type H, 3-stage Exhauster for chemical processing use. Capacity 13,100 cfm.



ROTARY

Installation of 4 Rotary Positive Gas Pumps in chemical plant, each with capacity of 5,370 cfm.

ROOTS-CONNERSVILLE

BLOWER BUILDERS SINCE 1878

ONE OF THE DRESSER INDUSTRIES

QED, *cont. . .*

pany's attitude will be toward the commercialization of a new development after it is completed.

To assist the management in reaching such decisions, research people have a definite responsibility for supplying certain information in a form where it can be used intelligently by management. They also have a responsibility for insisting that management face these decisions before too much research money is committed.

If a research development is to be completed without the waste of funds, it is important that every phase of the work be carried out with constant checking of the commercial importance of the various phases of the investigation and the constantly changing results which the work may uncover. This calls for a very close but very flexible gearing of the research activity to sales and market developments.

C. F. Rassweiler, Johns-Manville Corp., before the Western Connecticut Section of the American Chemical Society, Stamford, Oct. 18, 1949.

PETROLEUM

. . . *False Economy*

D. P. Clark

Economies gained by salvaging used lubricating oils are so small that they hardly justify the accompanying risk of shutdowns or increased maintenance costs. Fluctuating amounts of nonpetroleum contaminants—such as water, soot, dust, and metallic parts—make it difficult to determine the "reclaimable percentage" of any batch of used oil. This fact affects the economic aspects of oil salvage.

Saving the few cents per gallon which may be realized by following this practice cannot be justified when the product is used in units costing up to many thousands of dollars. At the end of the year these few cents in saving per gallon amount to very little.

Why, then, in the light of present knowledge, jeopardize the operation of expensive machines or incur heavy maintenance bills, in a gamble for such small stakes?

Dayton P. Clark, Gulf Oil Corp., before the American Petroleum Institute, Chicago, Nov. 9, 1949.

YEAH, WHO?

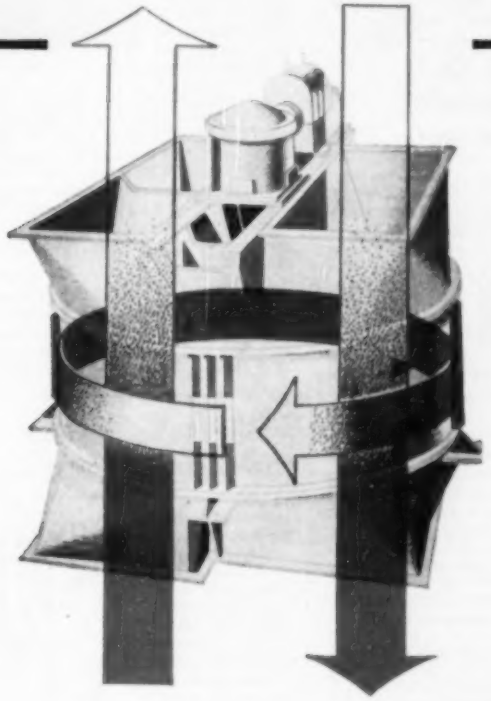
"If the government supports everybody, then who will support the government?"

EARL BUNTING, *Managing Director National Association of Manufacturers*

more than 160,000,000 lbs/hr of post-war steam generating capacity

equipped with *Ljungstrom*

AIR PREHEATERS



Here indeed is impressive evidence of the wide acceptance of the Ljungstrom air preheater. Since the war the total capacity of steam generating units equipped with Ljungstrom air preheaters, installed, under construction or on order in industrial and utility plants throughout the country comes to well over 160,000,000 lbs of steam per hr.

The reasons for the steadily increasing preference for the Ljungstrom air preheater are simple enough. The continuous regenerative counterflow principle assures maximum heat transfer with minimum weight and size. Flexible and compact, it may be used in a wide range of applications. Its proven reliability and low maintenance eliminate costly shutdowns.

If you are planning to build a new plant or modernize an old one, investigate the possibilities of the Ljungstrom. The specialized experience of Air Preheater engineers is at your disposal, to aid in effecting the most economic heat recovery from flue gases.

The Ljungstrom operates on the continuous regenerative counterflow principle. The heat transfer surfaces in the rotor act as heat accumulators. As the rotor revolves the heat is transferred from the waste gases to the incoming cold air.

THE AIR PREHEATER CORPORATION

60 EAST 42d STREET • NEW YORK 17, NEW YORK

FACTS ON FILTERING

Representative case histories on widely varied clarification problems condensed from field reports of Johns-Manville Filtration Engineers

Lens Polish Maker Saves Time Filtering Sulphuric Acid With Filter-Cel

(reported by J-M Engineer J. H. Corbett)

NEW YORK DISTRICT: This company produces a glass lens polish. Filtration is an important step in the process and is used for removing fine silica particles from sulphuric acid.

Before they used any filter aid, it took 10 hours to filter a 1200-gallon batch of the acid solution through a 24" x 24" plate filter. The screen quickly became clogged with silica which seriously cut down the flow rate.

Using 25 lbs. or .25% of our Filter-Cel, we reduced the cycle time to 2½ hours. This gave an increase in flow rate from .75 gal. per sq. ft. to 3 gal. per sq. ft. per hour.

By doubling the amount of filter aid, I demonstrated that the cycle time could be further reduced to two hours, but since the additional half-hour saved is not important, and they were well satisfied with the first trial, they will continue with the 25 pounds of filter aid used in the original run.

Gets 1000 Gal. Step-Up In Soap Filtration With Hyflo Super-Cel

(reported by J-M Eng. P. A. Martinson)

MINNEAPOLIS DISTRICT: While making a service call on a soap manufacturer recently, I found they were having trouble filtering scrub soap.

I inspected their filter station and found that they were covering their cloths with a light paper to make for easier cleaning. During the filtering operation this paper became discolored and showed evidence of plugging. In order to keep the slime off the paper, I suggested that they precoat with Hyflo Super-Cel and also use Hyflo in the main body filtration. I also recommended that they make a change in the type of filter cloth they were using.

Previously, they had been getting 900 to 1000 gallons through per eight hour shift. On the run with Hyflo, we put 2000 gallons through in the same period. Needless to say, they were pleased with the improvement and will continue to use Hyflo.

Helps New Filter Station Off To Good Start

(reported by J-M Eng. W. J. Buckley)

PHILADELPHIA DISTRICT: One of my customers was setting up a new filter station for the reclamation of kerosene wash solvent. They called on me for help and I made a trip to their plant to help them get started.

This solvent is used by them for cleaning printing rolls, and contains not only ink and color, but some grease as well. The installation included a small 24 sq. ft. filter and a direct connected herringbone gear pump driven by a ½ H.P. motor. It has an automatic cutout at 20 lbs. pressure. The filter screens are covered with cotton cloth which we precoated with 3 lbs. of Hyflo Super-Cel by recirculation.

Examination of a sample of the solvent returning to the precoat tank showed it to have good clarity and the flow was then switched over to the clear solvent tank. I also recommended the substitution of a centrifugal pump for the gear pump so that they can take full advantage of the maximum pressures possible with their filter.

Hyflo Makes Apple Pressing Easier

(reported by J-M Eng. F. D. Richards)

CINCINNATI DISTRICT: During my first call on this customer, I recommended the use of 2% Hyflo Super-Cel as a pressing aid in their apple pulper.

Recently, when I called again, they informed me of their results. Ordinarily, with the kind of apple they are using at present, the press cake is squashy and slippery. With Hyflo, the cake is much firmer and they are able to operate the press at a higher pressure. This, according to their estimate, has increased the juice yield by approximately 5%.

Although with other types of apples, no increase in yield has been noted, the addition of Hyflo does permit easier stripping of the cake, and this advantage alone is sufficient to justify its use.

How To Get Help With Your Filtration Problems...

If you are not getting the desired clarity or if your filtration flow rates are too slow, here is a helpful suggestion. Just call in your nearest Johns-Manville Filtration Engineer. His experience with all types of filtration problems should enable him to locate and correct the trouble without difficulty. If your present filter aid is at fault, he can recommend a grade of Celite Filter Aid that will give you any required combination of clarity and flow rate. Just write Johns-Manville, Box 290, New York 16, N. Y., for the address of the J-M Filtration Engineer nearest you.

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Chemical Engineer's Bookshelf

LESTER B. POPE, *Associate Editor*

Chemical History Made Palatable

AMERICAN CHEMICAL INDUSTRY—A HISTORY. By Williams Haynes. D. Van Nostrand Co., New York. Six volumes, $60.

Vol. II. The World War I, Period 1912-22. 440 pages (1945).
Vol. III. The World War I, Period 1912-22. 606 pages (1945).
Vol. IV. The Merger Era, Period 1923-29. 638 pages (1948).
Vol. VI. The Chemical Companies— to 1948. 560 pages (1949).

With four down and but two to go, it's high time to call attention to one of the most prodigious literary efforts of the chemical profession. The first two handsome volumes of this impressive series have been with us for a long time. We have found them both interesting and useful. Lately the publishers sent us Vol. IV and Vol. VI and over the holidays we spent many pleasant hours in reminiscent reading and re-reading of this very humane history of the American chemical industry.

All of us owe a great debt to the master historian, Williams Haynes, his History Committee and its Advisory Council. Nor should we forget that the project would not have been possible without the generous support of many chemical companies and the heavy investment in time and money on the part of such leaders as William J. Hale, Lammot du Pont, Charles H. McDowell, August Merz and George W. Merck—to mention but a few.

It was no accident that the two volumes covering World War I should be the first to appear. The author deliberately elected to complete them at a time when he could still draw on the first-hand knowledge of many of the men he was writing about. The result is a remarkably meaty collection of facts and figures, larded with personalities and illuminating incidents that make the whole both nourishing and appetizing. This is especialy true for those of us who came into the industry during those four fateful years—1914-1918—which, in the words of the author, "were the four years of college when the vigorous young industry burned midnight oil mastering stiff courses in technology and economics, during which it grew, found itself, realizing for the first time the

Williams Haynes
"master historian"

man's part it would be called to play in our modern world."

During and immediately preceding the war, Woodrow Wilson played a most important part in the development of the American chemical industry. The early work of the United States Tariff Commission, the dye embargo, the chemical unit in the War Production Board under Baruch, Leland Summers and Charles H. McDowell,—the inflation of 1919 and the drastic collapse of 1921 make these first two volumes of greatest significance. Then were laid the foundations for the vigorous growth and development which we saw later in the 20's—in the "Merger Era."

Subsequent volumes are more directly concerned with the industries themselves—and only indirectly with contemporary events in the political and economic history of the country. Here the author is at his best for he delights in recounting the stories of the various companies and corporate groups that go to make up the chemical industry. In Vol. IV he deals with the great mergers which in the pattern of Allied and Carbide resulted in tremendous expansion rather than contraction of competitive activities. To a lesser extent he deals with the broadening aspects of chemical technology as "mass production entered the realm of chemical manufacturing, bringing with it prolific output and lower costs."

Valuable features of each volume include a detailed and excellent chemical chronology—contemporary photographs and intimate footnote biographies of several hundred individuals of each era. Commendation is also due for the abundant reference and the selected bibliographies that follow each chapter. Appendixes, for the most part, are concerned with statistical data on production and consumption, prices, tariff rates, contracts and specifications. Each volume has extensive name and subject indexes.

The final volume (VI) has been characterized by the author as "an obligatory appendix to the historical record of the industry." In other words, it fills in the detail of the roles played by the individual companies in our national chemical development. More than 200 company histories are crammed into less than 500 pages. They have been edited "to strictly factual, almost encyclopedic form." As a result they have lost much of the glamor and human interest that characterize the other volumes. Yet they form an extremely important and necessary supplement to the series.

With growing impatience we are waiting for Vol. I on the early history of American chemical industry and Vol. V that presumably will deal with the depression of the 30's, leading up to World War II and its chemical aftermath. When completed, these volumes should give us the most complete and authoritative record of our industry and profession available anywhere. As such the series should be a part of every self-respecting chemical library in the American chemical industry.—*SDK*

BIOGRAPHY OF A GENIUS

A MEASURE FOR GREATNESS: A SHORT BIOGRAPHY OF EDWARD WESTON. By David O. Woodbury. McGraw-Hill Book Co., New York. 230 pages. $4.

Reviewed by H. C. Parmelee

Rebelling against his father's choice of medicine as a profession, and ultimately leaving home to avoid family friction, Edward Weston migrated

(*Continued*)

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from England to the United States at the age of 20 to follow his natural bent for science. During the next 50 years he achieved fame and fortune in the field of electricity, and became one of America's bright stars in the electrical firmament. His biography reads like a from-rags-to-riches romance, for when he landed in New York "his entire wealth consisted of some books, one or two favorite pieces of homemade apparatus, a Bible, and a few pounds in cash." He had not forgotten, however, to bring letters of introduction to distinguished American scientists, at least one of whom—Professor Chandler of Columbia University—proved helpful in time of need.

But there was nothing fortuitous in Weston's rise to distinction. He worked for it. He worked prodigiously—to the point of exhaustion of others as well as himself. In addition to his great capacity for work, he had the passion of genius for precise accurate knowledge based on painstaking research and investigation. His standards of dissatisfaction were gratified with nothing short of perfection, if that were possible; and the problem of the moment consumed his energies to the exclusion of all else until a solution was found. Defeat was not in the lexicon of this brilliant investigator.

A mere catalog of his activities gives a measure of his talents. He lifted electroplating out of the empirical, and put it on a scientific basis. Dissatisfied with batteries as a source of power, he designed dynamos for electroplating, for electrolytic refining of metals, and for electric lighting. His interest in lighting led to the design of arc and incandescent lamps, modifying the garish light of the former with metallic salts in the so-called flaming arc, and developing a satisfactory carbon filament for the latter. The gas-filled incandescent bulb was also his idea, as was the use of thorium oxide for removal of residual air and occluded gases from lamp bulbs. In all of these developments Weston excelled his competitors by reason of his scientific talents.

But a later generation of engineers who know him principally for his electrical measuring instruments can easily be forgiven if they confess ignorance of his earlier achievements. He was the father of precise electrical measurement, and his development of portable volt and ammeters made his name a household word throughout industry. Other names are identified with dynamos and motors and incandescent lamps, and the arc lamp is only a memory, but the name of Weston is perpetuated through the instrument manufacturing company that he founded and operated for many years. It was typical of the wide range of his investigations that, in the course of perfecting his voltmeter, he went deeply into metallurgical research that yielded the alloys constantan and manganin, essential for shunts and resistors. And having captured the instrument business, Weston turned his attention to the invention of a standard cell. Substituting cadmium for zinc, which was used in the Clark cell, Weston designed a cell with a potential of 1.0183 volts which subsequently became the world's official standard of electromotive force.

In his lifetime Weston was honored by McGill University with the degree of doctor of laws, and by Stevens Institute of Technology and Princeton University with degrees of doctor of science. The Franklin Institute awarded him the Elliott Cresson and Franklin medals; and he also received the Perkin medal from the Society of Chemical Industry and the Benjamin Lamme medal from the American Institute of Electrical Engineers which he had once served as president.

In the closing chapter of the book the biographer tells something of "The Man Behind the Mask." Here we see a man who understood little or nothing of relaxation; who couldn't help "engineering" his avocations; who enjoyed litigation enough to start a fight if none was in prospect; who perfected himself as an expert witness that confounded his opponents and convinced the courts; who tried and mastered many forms of sports, but who met his Waterloo in golf; who finally became an American citizen when he retired from active business; and who died at 83, full of years and honor. All this and more too is delightfully told by the author in unfolding the drama of a remarkable personality.

On IG CH. & CO

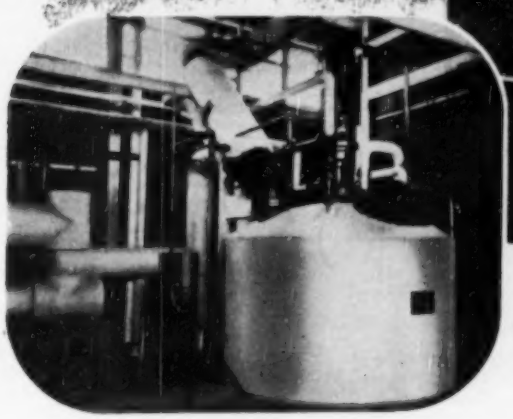
ACETYLENE AND CARBON MONOXIDE CHEMISTRY. By John W. Copenhaver and Maurice H. Bigelow. Reinhold Publishing Corp., New York. 357 pages. $10.

Reviewed by Thomas L. Jacobs

From the mass of detailed, often non-critical and repitious reports of the development of the chemistry of acetylene under pressure in the laboratories of the I. G. Farbenindustrie under the direction of Walter Reppe, it is valuable to have a connected summarizing account by experts in the field. The book is such an account

(*Continued*)

To avoid product contamination you can't beat Stainless Steel



Converters for the hydrogenation of fatty acids at General Mills' Kankakee plant are made from Stainless Steel.

One of two Stainless Steel esterification kettles at General Mills' fatty acid plant, Kankakee, Ill.

TIME AFTER TIME, plant engineers have turned to Stainless Steel equipment as the surest method of avoiding the danger of product contamination during chemical processing.

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and claims no other objectives. The chapters on vinylation, ethinylation and cyclopolyolefins are relatively complete because most of the work on these reactions has been reported only in the government technical rports or in patents of the I. G. Farbenindustrie. The chapter on handling acetylene under pressure is very valuable, but might have been even more so if all other references on the subject had been included. The chapters on reactions of acetylene at atmospheric pressure and on acetylene homologs are very brief because the new German work was not extensive.

The section on carbon monoxide chemistry is a single chapter (about one-seventh of the book) describing the reactions of carbon monoxide with acetylene and with olefins in the presence of metallic carbonyls and carbonyl hydrides forming acids, alcohols and carbonyl compounds. No mention is made of the extensive chemistry of carbon monoxide developed outside the I. G. Farbenindustrie.

This book is written in an interesting manner and should be of considerable value to industrial chemists. It is to be regretted that omission of authors' names in the references and lack of identification of the titles in the general bibliography make these of less value than they otherwise would have been.

Quasi-National

COLLOID SCIENCE. Vol. II. Reversible Systems. Edited by H. R. Kruyt. (Translation by L. C. Jackson.) Elsevier Publishing Co., New York. 753 pages. $11.50.

Reviewed by Jerome Alexander.

Following an introductory survey of the subjects in this volume, come the following chapters: The Formation and Structure of Macromolecules; Thermodynamics of Long-Chain Molecules; The Physical Properties of Randomly Kinked Long-Chain Molecules; Determination of the Molecular Weight of Macromolecules; Macromolecular Sols Without Electrolyte Character; Sols of Macromolecular Colloids With Electrolytic Nature; Crystallisation. Coacervation, Flocculation; Reversal of Charge Phenomena, Equivalent Weight, and Specific Properties of Ionised Groups; Complex Colloid Systems; Morphology of Coacervates; Gels; Solid Macromolecular Systems With One (Chemical) Component; Association Colloids.

The book is a tribute to the high ability and industry of Dutch scientists, and besides giving a wide international survey, contains much detail and experimental data from Dutch literature not readily available. The subjects are considered on the basis of general phenomena rather than particular substances or systems. Stress is laid upon the concordance between classical colloid science (e.g., Freundlich's "Colloid and Capillary Chemistry") and the subsequently developed domain of macromolecular systems. "Colloid Science" is an adequately definable concept because colloid systems involve units of large size kinetically, even though these may differ in shape and size. There is undoubted continuity between the behavior of large and small kinetic units, for the colloidal zone is intermediate between the smaller molecules and microscopically or visually resolvable "hunks."

There are many tables and graphs and structural formulas which the theoretical chemist adores but which practical Dame Nature ignores, even if they indicate what ought to, and frequently does, happen. Some formulas of the Haworth type for carbohydrates appear on p. 27, but without reference to the now well-known pyranose-furanose basis. Your reviewer's impression is that this volume does not adequately consider X-ray work, but this might be made up in other volumes of the series. Despite its quasi-national nature, the book is packed with useful facts, views, information and references, and should be available to all interested in colloid chemistry and its applications. As usual, paper, printing and binding are excellent, and the price ($11.50) reasonable for so valuable a book.

Thermo

EINFUHRUNG IN DIE CHEMISCHE THERMODYNAMIK. (Introduction to chemical thermodynamics.) By Gustav Kortüm. Vandenhoeck & Ruprecht, Publishers, Goettingen, Germany. 300 pages. Paper bound DM 17.80, linen DM 22.

Reviewed by Max F. Wulfinghoff

This is a modern university text, presenting the general physical laws and pertinent data in the light of present knowledge, together with many practical hints useful in research work. The text offers a balanced treatment of

(*Continued*)

RECENT BOOKS RECEIVED

Organic Syntheses. Vol. 29. By C. S. Hamilton. Wiley. $2.50.

Trilinear Chart of Nuclear Species. By W. H. Sullivan. Wiley. $2.50.

Vacuum Equipment and Techniques. By A. Guthrie & R. K. Wakerling. McGraw-Hill. $2.50.

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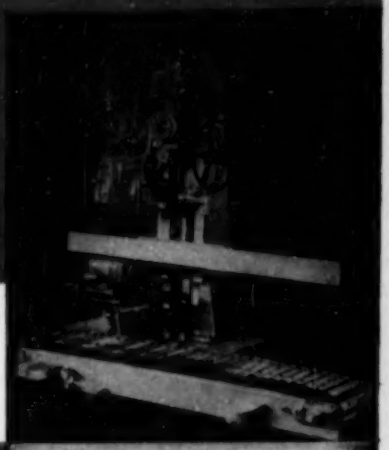

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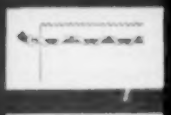

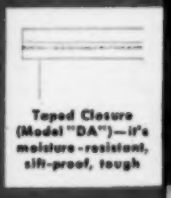

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its subject matter built up in logical fashion. The first chapter covers scope, fundamentals and definitions. Chapter 2 deals with volume functions and the gas laws. Chapter 3 covers the First Law of Thermodynamics, chapter 4 the Second Law, chapter 5 the thermal equilibrium relations. Chapter 6 is devoted to Nernst's Theorem, and chapter 7 to the thermodynamics of phase boundaries of systems of different orders, and related phenomena, as surface tension, wettability, adsorption.

While this is not a book in which the practicing engineer is likely to find ready answers to his everyday problems, it will give a reader conversant with basic scientific methods [and German] an adequate preparation for subsequent specialized courses.

Can You Do Addition?

A CHEMISTRY OF PLASTICS AND HIGH POLYMERS. By P. D. Ritchie. Interscience Publishers, Inc., New York. 288 pages. $4.50.

Reviewed by Stuart J. Canter

The uniqueness of the book is its aim and accomplishment of providing a compact, reasonably priced single volume, emphasizing almost exclusively the organic chemistry and its up-to-date industrial application of high polymers. Other reference works utilize the theoretical mathematical approach primarily, but Dr. Ritchie's development, without ignoring the fundamentals from which all research stems, wastes little time in providing the concepts and examples of useful polymerization. Thus, armed in a qualitative manner with a feel for such terms as degree of polymerization, addition and condensation polymers, cross-linking, and criteria for physical behavior, the neophyte prepares to cope with the vagaries of free radical mechanisms and inhibitors.

Having covered the major polymer fields in a concise, cogent manner, the author proceeds to discuss the principal types of synthetic addition and condensation polymers to which prolific modern industry has given birth. Ethenoid polymers (A-polymers) of the general formula $CH_2 = CRR'$ are for example represented by such familiar products as Lucite, Koroseal, neoprene and Vinyon. Under the heading of Synthetic Condensation Polymers are included nylon, phenoplastics, i.e., Bakelite, Durez etc., and aminoplastics.

A section of the text is then set aside for High Polymers in Nature adequately delving into the topics, cellulose, natural rubbers, lignin, and proteins. Inorganic chemistry is represented by silicate and carbon structures. The summary on silicones, which may be considered the bridge between inorganic and organic macromolecules recalls to mind the witty interpolation of Dr. Ritchie on mentioning Kipping's pioneer work on silicones. Kipping he remarks, "is one of the few authors of a long series of papers on a single topic who has had the courage to close the series formally."

The chapters of the book are engagingly introduced by appropriate comments from such diversified personalities as Robert Hooke and Lewis Carroll's White Queen who sets the tenor of the part dealing with addition polymers by asking, "Can you do addition? What's one and one and one and one and one and one and one and one and one?"

The text culminates in the most mathematical of the chapters in which molecular structure is related to physical properties. Here, if at all, is a well written fragment which the engineer will relish. It's got equations and what chemical engineer worthy of the name doesn't delight in substituting in equations!

TECHNIK

GRUNDRISS DER CHEMISCHEN TECHNIK. By F. A. Henglein. Verlag Chemie, G.m.b.H., Weinheim and Berlin. 636 pages.

Reviewed by J. H. Perry

In the original edition (1936), this book was an adaptation of lectures given to students who were familiar with analytical and physical chemistry and with elementary engineering subjects.

The present edition of 1949 like the previous editions is divided into two principal parts. Part I covers general chemical technology, such as: characterizations of chemical reactions, types of chemical processes, types of chemical engineering unit operations, the general construction of chemical plant buildings, the location and design of chemical plants, and such general subjects as labor, patents, material movement, and the like. Part II includes generally short but concise descriptions of many chemical processes, the production of charcoal, wood sugar, pectin, fats and oils, waxes, alkaloids, etc., and also many of the more strictly chemical processes. The original edition had 470 pages and 435 illustrations whereas the new edition has 636 pages and 600 illustrations.

This book is essentially an industrial chemistry text and reference. While considerable information is given on many types of equipment for many

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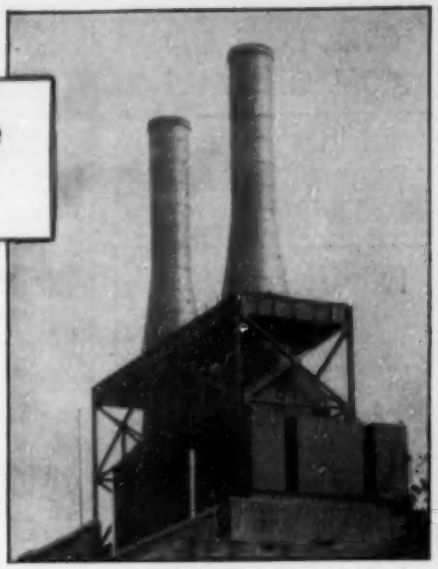
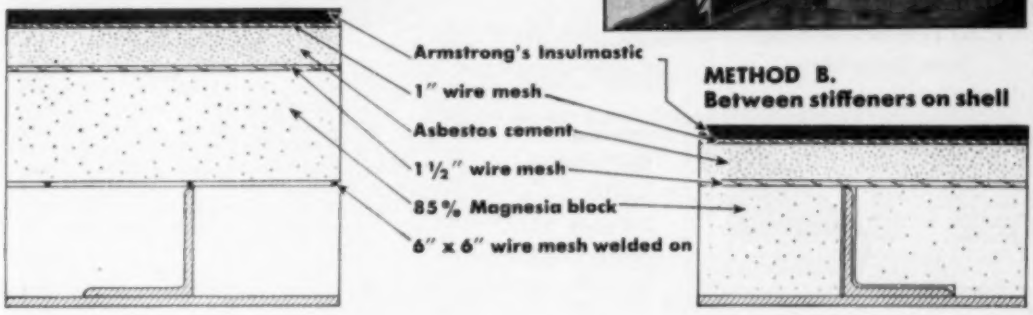
How would you insulate these dust collectors?



To prevent moisture condensation and corrosion inside these dust collectors, they are to be insulated with a layer of 1½" thick 85% Magnesia. How would you apply the insulation?

METHOD A.
Over stiffeners on collector shell



Here's what the Armstrong engineer recommended:

Of the two methods shown above, the application of the insulation over the stiffeners is most practical. The insulation is applied over 6" x 6" wire mesh, welded to the stiffeners. This mesh absorbs considerable "weave" and guards against the insulation's cracking as the collectors expand and contract. Also, the cost of applying the insulation over the wire mesh is lower than fitting insulation between the stiffener angles.

Method A also has the advantage of providing full insulation protection over the entire surface. In method B, the only protection over the stiffener is the wire mesh, plaster, and Insulmastic finish. The "weave" of the collectors will cause cracking at these points.

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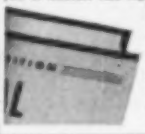

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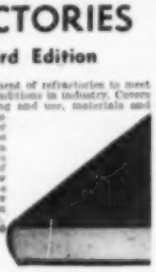

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of the unit operations of chemical engineering, this volume cannot be considered as an important chemical engineering information source. The coverage of industrial chemistry is very good especially from the standpoint of German conditions but the author has continued to include some information on American design, equipment, and other matters.

This new edition of Henglein should be a valuable addition to technical libraries, especially as a reference volume. This reviewer doubts that it should be widely recommended for purchase by individuals in the United States because of the availability of the many excellent American texts and reference books on all of the chemistry, chemical engineering, and allied subjects covered by the present German book.

The paper and the printing of this new edition is a great improvement over many of the German books published during the past years but the book cover paper is unreasonably poor. The detailed index should be entirely adequate for quick reference use.

Utilitarian

GAS TRANSPORTATION SYSTEM CALCULATIONS. By B. Miller. Moore-Robbins Publishing Co., New York. 226 pages. $7.50.

Reviewed by Joseph Joffe

The contents of this book are, with a few slight changes, taken from a series of 40 articles by Benjamin Miller, which appeared recently in the magazine Gas Age. The four principal subdivisions of the book deal with (1) the flow of gas in pipes, (2) specification, inspection and testing of pipe for gas lines, (3) the compression of gas, and (4) the economics of gas transportation.

The book is frankly utilitarian in outlook, with emphasis on methods of calculation selected and developed by the author and his associates. It should be an invaluable aid to those who wish to familiarize themselves with the design and operation of systems for the transportation of gaseous fuels, and it will also serve as a useful reference for those engineers who are already engaged in this field of work.

It is obvious that the book is not intended to be a treatise on the subject of gas flow. It lacks references to literature either past or current. Methods of attack developed by others in the fields of fluid friction and departure from ideal gas laws receive scant attention. However, there is much in the book which is original and of interest to the chemical engineer. For instance, the author presents friction factor formulas which eliminate trial-and-error calculations from many gas flow problems. While the derivation of these formulas is not given, it appears to the reviewer that they are variants of von Karman's formula relating friction factor to Reynolds number. The method of corresponding temperatures for obtaining compressibility factors and residual entropies and enthalpies of natural gases is a novel one, and is claimed to be more accurate than analogous methods based on the theorem of corresponding states. The discussion of the operation and work of compressors is better than may be found in most texts. The book also contains an excellent discussion of the economic balance as applied to design of gas transportation systems.

This book is recommended as a valuable addition to a chemical engineer's library.

Recent Books & Pamphlets

Tips on Trade With Marshall Plan Countries. Published by the National Association of Manufacturers, 14 West 49th St., New York, N. Y. 46 pages. Explains how to go about getting orders financed with ECA funds; discusses the future of ECA-financed business; lists the forms of ECA assistance available to small business.

Steel Products Manual. Steel Tubular Products, Section 18, published by American Iron and Steel Institute, 350 Fifth Ave., New York 1, N. Y. 229 pages. Classification of various grades of steel according to proper fields of application.

Report of the Committee for Standardization of Engineering Products. Published by His Majesty's Stationery Office, York House, Kingsway, London, W.C.2, England. 36 pages. 9d. Report on an investigation conducted in England to determine whether any reduction in the variety of products manufactured is desirable in the light of technical, commercial and other considerations.

Development of a Structural Clay Products Industry Using Florida Clays, Part I. By A. F. Greaves-Walker, F. F. Turner and R. S. Hagerman. Bulletin 30, published by the Florida Engineering and Industrial Experiment Station, University of Florida, Gainesville, Fla. 48 pages. 50 cents. Sources, analyses and tests of raw materials. Evaluation of finished products and manufacturing cost data.

Bulletin of Positions Open for Scientists and Engineers. Issue No. 1, January 1950, published by Scientists' and Engineers' Assn., Rock Rimmon Rd., Stamford, Conn. 8 pages. 30 cents. Descriptions of scientists, engineers and designers available for employment. Published every 2 to 3 weeks. Subscription price for 5 issues is $1.

Directory of Biological Laboratories. Fourth edition. Published by Burns Compiling & Research Organization, 200 Railway Exchange Bldg., Chicago 4, Ill. 140 pages. $3. Lists laboratories of the United States concerned with biological, bacteriological or biochemical investigations.

Prospectus on the Preparation of a Digest of Petroleum Refining Patents and Related Services. Published by Georgia Institute of Technology, State Engineering

(Continued)

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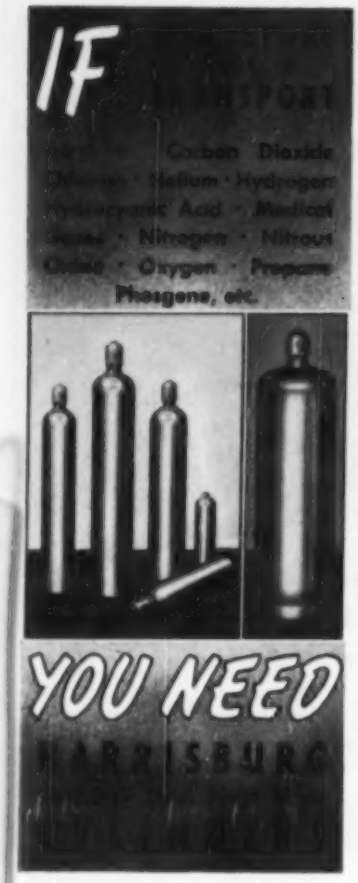

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BOOKSHELF, cont. . .

Experiment Station, Atlanta, Ga. 27 pages. Introduction of a plan to prepare a bi-weekly digest of petroleum refining patents and such additional related services as may be required.

A.S.T.M. Standards on Soaps and Other Detergents. Published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. 132 pages. $1.75. Definitions of terms, methods of analysis and 32 specifications.

How to Run a Lathe, Vol. I. Forty-ninth edition. Published by the South Bend Lathe Works, South Bend 22, Ind. 128 pages. 25 cents. Correct installation and leveling of the lathe, grinding cutter bits, turning, boring, thread cutting, taper turning, drilling, reaming, and tapping.

General Engineering Types of Steel Castings. Published by Steel Founders' Society of America, 920 Midland Bldg., Cleveland 15, Ohio. 4-pages. Tabular listing of most general engineering types of steel castings classified according to tensile strengths.

GOVERNMENT PUBLICATIONS

The following recently issued documents are available at prices indicated from Superintendent of Documents, Government Printing Office, Washington 25, D. C. In ordering any publications noted in this list give complete title and issuing office. Remittances should be made by postal money order, coupons, or check. Do not send stamps. All publications are in paper cover unless otherwise specified. When no price is indicated, pamphlet is free and should be ordered from bureau responsible for its issue.

Wood. "Wood Pulp, Paper and Board—1948." Bureau of the Census, Series: M14D-48. Annual statistical summaries of monthly reports made by industry to the Bureau.

Spectrophotometry. "Spectrophotometry." By K. S. Gibson. National Bureau of Standards. Circular 484. Price 25 cents. A summary of the techniques and data resulting from the bureau's experimental work in ultraviolet, visible, and near-infrared regions. Includes description of instruments, their calibration and use.

Labor. "Collective Bargaining Provisions—Seniority." Bureau of Labor Statistics, Bulletin 908-11. Price 20 cents. Quotations from about 270 union contracts showing seniority provisions now operating in a large number of companies.

Safety. "Injuries and Accident Causes in Textile Dyeing and Finishing." Bureau of Labor Statistics, Bulletin No. 962. Price 45 cents. A detailed analysis of hazards, and 1945 injury-frequency rates by region, size of plant, and occupation.

Alcohol. "Statistics on the Uses of Specially Denatured Alcohol, Fiscal Year Ended June 30, 1949." Bureau of Internal Revenue, Alcohol Tax Unit. Mimeographed. Annual statistical summary.

Plastics. "Preservation of Agricultural Specimens in Plastics." By G. R. Fessenden, U. S. Department of Agriculture. Miscellaneous Publication No. 679. Price 25 cents. Of interest to plastic makers as well as agricultural research workers.

Insecticides. "The DDT, Toxaphene, and Chlordane Content of Milk as Affected by Feeding Alfalfa Sprayed with these Insecticides." By R. E. Ely et al. U. S. Department of Agriculture, BDIM-Inf-85. Mimeographed.

Coal. "Average Heating Values of American Coals by Rank and by States." By

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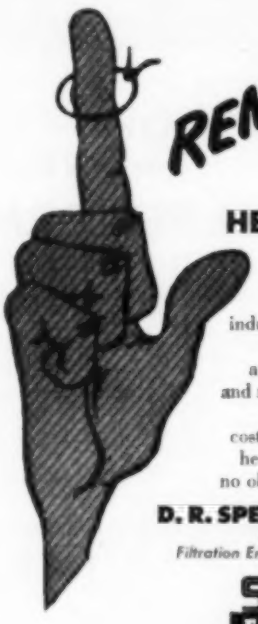

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This Life-Line chemical motor offers more protection against corrosion than any motor we've ever built. It's protected at every point.

Frames, brackets, feet are Bonderized; then given four protective coatings. The first is a formaldehyde alkyd-type enamel, well known for its superior corrosion resistance. To assure perfect bonding, it is baked for 30 minutes at 250° F. Two dips and bakes of tough, flexible Thermoset varnish are then applied. Finally, the exterior finish coat of gray lacquer is sprayed on.

Stator windings, too, are double dipped and baked in Thermoset. A bronze blower provides adequate cooling . . . stands up to tough corrosive atmospheres. Neoprene bearing seals are an added precaution. Bearings are factory-sealed and prelubricated . . . need no further lubrication.

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Govt. Pubs., cont. . .

G. J. Flynn, Jr. Bureau of Mines, Information Circular 7538. Mimeographed.

Alumina. "Recovery of Alumina From Submarginal Bauxites." Part 1: Electric Furnace Production of Calcium Aluminate and Ferro-Alloy. By C. E. McCarthy et al. Bureau of Mines, Report of Investigations 4527. Mimeographed. Part 2: Extraction of Alumina From Electric-Furnace Slags of Calcium Aluminate. By M. R. Thompson et al. Bureau of Mines Report of Investigations 4528. Mimeographed.

Costs. "Guide for Making Cost Estimates for Chemical-Type Operations." By C. W. Van Noy et al. Bureau of Mines, Report of Investigations 4534. Mimeographed. Outlines with illustrations and suggested typical figures a complete system of forecasting manufacturing costs and other elements making up total cost of sales.

Gold. "Recovery of Fumes from Chloride Volatilization of Gold." By A. L. Engel and H. J. Heinen. Bureau of Mines, Report of Investigations 4562. Mimeographed.

Gasoline. "National Motor-Gasoline Survey, Summer 1949." By O. C. Blade. Bureau of Mines, Report of Investigations 4644. Mimeographed. A detailed statistical summary of the regular field survey.

Lead. "Lead Smelting in the Ore Hearth." II The Development of the Ore Hearth: Its Smelting Column. By G. L. Oldright. Bureau of Mines, Report of Investigations 4563. Mimeographed.

Alumina. "Differential Thermal Analysis Applied to the Lime-Soda Sinter Process." By A. J. Kauffman, Jr. Bureau of Mines, Report of Investigations 4595. Mimeographed. Information on the characteristic heat reactions of bauxite, kaolin and other high-aluminous materials, obtained during a Bureau study of the recovery of alumina from domestic low-grade sources.

Dust Counts. "Relation Between and Precision of Dust Counts (Light-And-Dark-Field) From Simultaneous Impinger, Midget-Impinger, Electric-Precipitator, and Filter-Paper Samplers." By C. E. Brown and H. H. Schrenk. Bureau of Mines, Report of Investigations 4568. Mimeographed.

Metallurgy. "Refining Metals and Alloys by Filtration." By H. W. St. Clair. Bureau of Mines, Report of Investigations 4614. Mimeographed. Gives typical phase diagrams and experimental data.

Kaolin. "Investigation of the Aiken Kaolin District, Aiken County, S. C." By K. M. Smith. Bureau of Mines, Report of Investigations 4606. Mimeographed.

Kaolin. "Investigation of the Mueller Kaolin Deposit, Jeff Davis County, Tex." By W. D. McMillan et al. Bureau of Mines, Report of Investigations 4588. Mimeographed.

Tennessee Valley. "Annual Report of the Tennessee Valley Authority, 1949." For the Fiscal Year Ended June 30, 1949. Price 65 cents. Includes complete summary of industrial operations and some new information from the research program.

Radioactivity. "Measurements of Radioactivity." Bureau of Standards, Circular 476. Price 35 cents. Background material for research on radioactivity and nuclear physics.

Plastics. "Available Patents — Plastic Products & Processes." Department of Commerce. Price 25 cents. Suggestions for new plastic products for manufacture in 21 product fields.

Screw Threads. "Unified Screw Thread Standards." Bureau of Standards, Circular 479. Price 20 cents. Unification of American, British and Canadian standards.

Atomic Energy. "A.E.C. Purchase Rules." Price 10 cents. United States Atomic Energy Commission contracting offices and types of commodities purchased.

Animal Nutrition. "Comparison of Methods of Supplying Phosphorus to Range Cattle." By W. H. Black et al. Department of Agriculture, Technical Bulletin No. 981. Price 10 cents.

—*End*

(No. 10)

Filterability Of Activated Carbon

Maximum filterability of activated carbon implies complete clarity of the filtrate and a good rate of filtration. These are provided for through close control of particle size and shape, and of particle size distribution in the grinding step of manufacture.

Filtrate clarity and filtration rate depend also on the liquid being handled and the filter equipment used. Some liquids take longer than others to clear up at the beginning of the filter cycle. The viscosity of the liquid and the nature and amount of colloidal and suspended matter affect the filtration rate.

Final evaluation of carbon filterability must therefore be made in the plant under operating conditions. It involves measuring the time required for the filtrate to clear and the *total* time needed to filter a given batch of the liquid. Filtration rates are expressed in gallons per hour per square foot of filter area.

Read next month's column for data on another important specification of activated carbon: *retention loss*.

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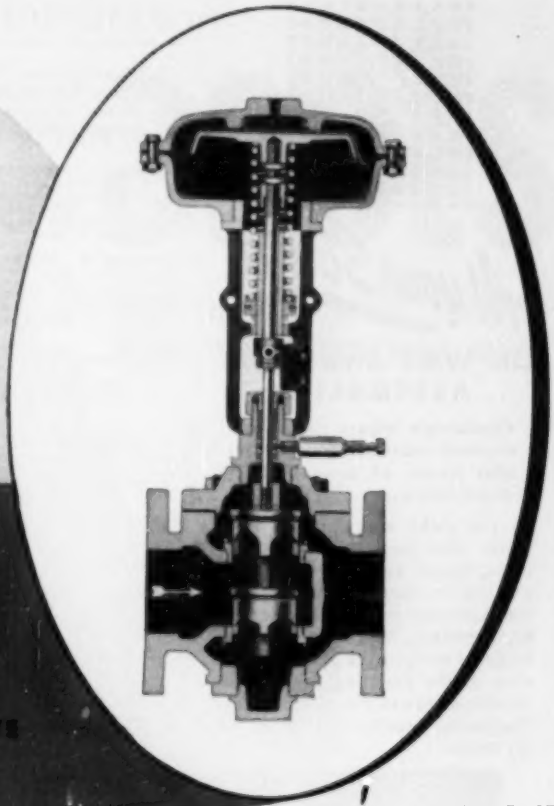

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MANUFACTURERS' LATEST PUBLICATIONS

Publications listed here are available from the manufacturers themselves, without cost unless a price is specifically mentioned. To limit the circulation of their literature to responsible engineers, production men and industrial executives, manufacturers usually specify that requests be made on business letterheads.

Insulation. Owens-Corning Fiberglas Corp., 16 East 56th St., New York 22, N. Y.—16-page Bulletin 27 contains data on thermal conductivity and sound absorption of glass fiber insulation. Photographs show applications.

Compressors. Pennsylvania Pump and Compressor Co., Easton, Pa.—24-page Bulletin 203 illustrates and describes overall performance and functions of various parts of horizontal duplex compressors. Includes a large, fully labeled cutaway drawing.

Vinyl Butyral Resins. Bakelite Corp., 300 Madison Ave., New York 17, N. Y.—22-page Bulletin 11 covers general properties and applications in coatings and adhesives.

Instruments. Davis Regulator Co., 2541 South Washtenaw Ave., Chicago, Ill.—72-page Bulletin A-50 covers automatic pressure, flow and liquid level controls. Gives prices and diagrams of entire line of automatic valve specialties.

Air Conditioning. Niagara Blower Co., 405 Lexington Ave., New York 17, N. Y.—2-page Bulletin 112 describes a controlled humidity method of air conditioning. Flowsheet shows process in operation.

Chemicals. Gane & Ingram, Inc., 42 West 16th St., New York 11, N. Y.—Price list and catalog for fine chemicals and alkaloids.

Couplings. Thornhill-Craver Co., Inc., Houston, Tex.—24-page Bulletin 50 is a catalog section for couplings, fittings and valves for drilling, producing and pipelining oil. Includes construction and performance data, application photographs and cutaway drawings.

Filters. Oliver United Filters Inc., 33 West 42nd St., New York, N. Y.—Six 4-page leaflets on various types of filters. Bulletin 600 describes a disk type filter for continuous vacuum operation; Bulletin 701, continuous vacuum filter for recovering fine fibers in high-grade paper making; Bulletin 215, horizontal rotary filter; Bulletin 216, lime mud filter; Bulletin 217, precoat filter; Bulletin 113, Kelly pressure filter.

Chemicals. American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.—120-page Vol. I, New Product Bulletin, compiles technical data on 17 new products. Covers physical and chemical properties, chemical reactions, potential applications, toxicity and bibliography for each chemical. Data are illustrated with graphs and charts.

Polyvinyl Acetate. American Polymer Corp., 101 Foster St., Peabody, Mass.—16-page Bulletin P-15 reviews forms, properties and uses of polyvinyl acetate manufactured by the solution polymerization of vinyl acetate at high concentration in a variety of solvents. 32-page Bulletin P-16 covers properties, compounding, uses, storage and handling of polyvinyl acetate emulsions.

Fire Safety. Solvay Sales Division, Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.—22-page pocket-sized booklet describes the uses of calcium carbide in fire fighting equipment.

Formaldehyde. Celanese Corp. of America, 180 Madison Ave., New York 16, N. Y.—30-page booklet contains details on the properties of formaldehyde which influence its handling.

Tool Steel. Joseph T. Ryerson & Son, Box 8000-A, Chicago 80, Ill.—2-page filer gives properties, stock sizes and prices.

Cements. Pennsylvania Salt Mfg. Co., Special Chemicals Dept., 1000 Widener Bldg., Philadelphia 7, Pa.—Chart shows resistance of resin and silicate cements to various corrosive chemicals.

Materials Handling. Stokes and Smith Co., 4962 Summerdale Ave., Philadelphia —4-page bulletin contains photographs and brief descriptions of semiautomatic and fully automatic filling machines for powdered and granular products.

Motor Accessories. Reeves Pulley Co., Columbus, Ind.—8-page Bulletin M-4917 describes and contains diagrams of varied installations of a line of variable speed drives with fractional horse-power sizes.

Solvents. Pennsylvania Industrial Chemical Corp., Clairton, Pa.—6-page folder gives characteristics and typical analyses of solvents and solvent oils.

Swivel Joints. Chikaan Co., Brea, Calif.—71-page Catalog 50 describes ball-bearing swivel joints, unions, blocks and thread compounds.

Materials Handling. Clark Equipment Co., Industrial Truck Division, Battle Creek, Mich.—8-page pamphlet contains sketches and specifications for fork-lift trucks and towing tractors.

Tube Boiler. Henry Vogt Machine Co., Louisville 10, Ky.—18-page booklet contains a series of sketches of installations of water tube boilers. Principal data are included.

Carbon Blacks. Godfrey L. Cabot, Inc., 77 Franklin St., Boston 10, Mass.—4-page leaflet lists some typical properties and uses of carbon blacks.

Pulverizers. Pulverizing Machinery Co., 130 Chatham Rd., Summit, N. J.—50-page booklet illustrates and describes a line of pulverizing and dust collecting equipment. Includes a 5-page list of materials to which equipment may be applied.

Electrical Appliances. Sorensen and Co., 375 Fairfield Ave., Stamford, Conn.—12-page Catalog No. A-1049 contains specifications and description of the standard voltage regulators for control of a. c. power. 8-page Catalog No. B-1049 lists a line of d. c. power sources and supplies.

Chlorine. Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia.—Wall chart on accident prevention and safety measures for handling of liquid chlorine. Chart is 14 by 19 in., printed in green and black on linen backed paper.

Metal Powders. National Radiator Co., Johnstown, Pa.—4-page Bulletin 867 illustrates and describes some applications of iron, steel, nickel, manganese and silicon powders.

Steam Generators. Foster Wheeler Corp., 165 Broadway, New York 6, N. Y.—12-page Bulletin PG-49-13 contains sketches and tables showing dimensions, capacity, size and other data of standard models of package steam generators.

Instruments. Fischer & Porter Co., 75 County Line Rd., Hatboro, Pa. 24-page Catalog Section 75 describes a line of instruments for indicating, measuring and controlling liquid level and interface level.

Electrode. Alloy Rods Co., York, Pa.—4-page Bulletin 10849 covers a chromeboride electrode for hard surfacing.

Wire Rope. Macwhyte Co., c/o R. G. Diehl, Kenosha, Wis.—4-page Bulletin 45-20 gives sizes and types of stainless steel and Monel metal wire ropes and typical uses.

Copper Coils. Knapp Mills Inc., 121 Broad St., New York 4, N. Y.—4-page leaflet covers efficiency of heat transfer, corrosion resistance and physical properties of lead covered copper coils.

Water Heaters. Patterson-Kelley Co., East Stroudsburg, Pa.—4-page leaflet gives storage and heating capacities of copper-lined hot water storage heaters.

Hose. B. F. Goodrich Co., Akron, Ohio.—2-page Bulletin 4440 covers sand blast hose and butane-propane hose. 4-page

(*Continued*)

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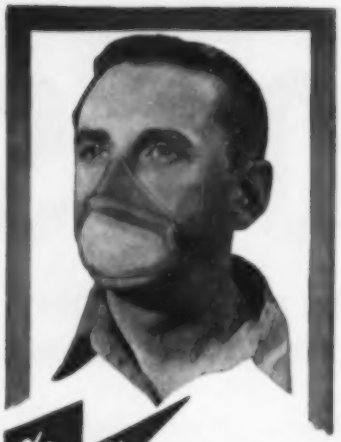

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MFR.'S PUBS., cont. . .

Bulletin 4780 describes industrial vacuum hose.

Multilayer Vessels. A. O. Smith Corp., 155 East 44th St., New York 17, N. Y.—8-page Bulletin V-52 covers manufacture and construction of multilayer pressure vessels.

Soot Blowers. Vulcan Soot Blower Corp., Dubois, Pa.—16-page Bulletin 483 describes automatic-sequential power-operated soot blowing systems. Includes diagrams of typical installations.

Instruments. Fischer & Porter Co., 75 County Line Rd., Hatboro, Pa.—4-page Catalog 62 covers operations, specifications and typical installations of a chemical feeder for liquids and gases.

Steel Castings. Dodge Steel Co., Tacony, Philadelphia, 16-page booklet covers metal specifications, chemical properties and physical properties.

Brushes. M. W. Jenkins' Sons, Inc., Cedar Grove, N. J.—8-page Bulletin 10 describes a line of brushes with metal cores and their applications in industry.

Synthetic Fiber. Carbide and Carbon Chemicals Corp., 30 East 42nd St., New York 17, N. Y.—6-page Bulletin F-7437 gives properties, textile characteristics and suggested applications of a fiber spun from a copolymer of acrylonitrile and vinyl chloride.

Materials Handling. Lewis-Shepard Products Inc., 264 Walnut St., Watertown 72 Mass.—16-page Bulletin 25 contains specifications and dimensional drawings of a line of electric fork trucks.

Hermetic Seals. Hermetic Seal Products Co., 37 South 6th St., Newark 7, N. J.—16-page catalog contains photographs of general kinds of seals and engineering drawings giving details of specific alternative designs.

Instruments. Consolidated Engineering Corp., 620 North Lake Ave., Pasadena 4, Calif.—16-page booklet describes operation and performance of leak detectors for evacuated or pressure systems.

Flooring. Ralph V. Ruion, Inc., 2900 North 2nd St., Philadelphia.—8-page leaflet discusses the acid resisting, waterproof and slip-proof qualities of this company's asphalt floors.

Dust Collectors. American Wheelabrator and Equipment Corp., 732 South Byrkit St., Mishawaka, Ind.—4-page Bulletin 242 deals with the use of Dustube dust collectors in the manufacture of rubber goods.

Valves. Kennedy Valve Mfg. Co., Elmira, N. Y.—12-page, pocket-sized Circular No. 102 illustrates bronze gate valves for steam, water, oil or gas.

Safety. Willson Products, Inc., Reading, Pa.—64-page booklet catalogs line of eye and respiratory safety equipment.

Instruments. Thwing-Albert Instrument Co., Penn St. and Pulaski Ave., Philadelphia.—2-page Bulletin P-4910 contains sketch of a variety of gravimetric water vapor permeability cups.

Pressure Vessel Accessories. Lenape Hydraulic Pressing and Forging Co., P. O. Box 120, West Chester, Pa.—64-page Catalog 9-49 illustrates with blueprints and photographs a line of welding necks, manways, nozzles, covers, rings, etc.

Instruments. Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.—4-page brochure illustrates an infrared analyzer for measuring atmospheric contamination and precise process control.

Driers. F. J. Stokes Machine Co., 5900 Tabor Rd., Philadelphia 20, Pa.—4-page Bulletin 701 describes a line of vacuum shelf dryers for uniform, low-temperature drying without agitation.

Acid Inhibitor. Monsanto Chemical Co., St. Louis 4, Mo.—4-page Bulletin 9-59 deals with the function and use of an acid inhibitor developed for the steel industry.

—*End*

MONARCH NOZZLES SOLVE YOUR SPRAY PROBLEMS

Remember, if the liquid can be sprayed with direct pressure, Monarch can furnish the Nozzles.

Fig. 980

In many industries, Monarch Spray Nozzles are used for . . .

ACID CHAMBERS
AIR WASHING
CHEMICAL PROCESSING
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OIL BURNERS
SPRAY DRYING

Catalogs 6 A and 6 C Sent on Request

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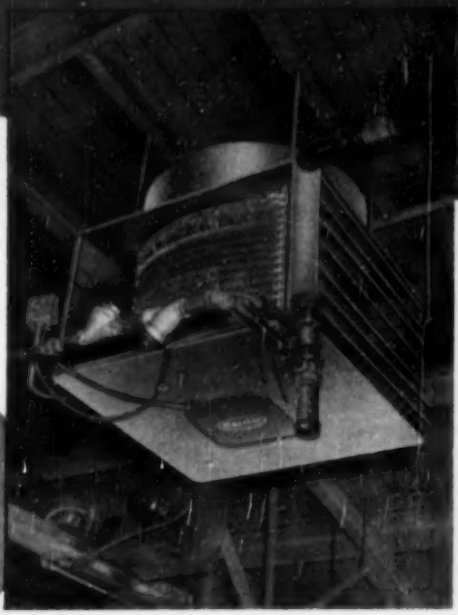
PHILADELPHIA 34, PA.

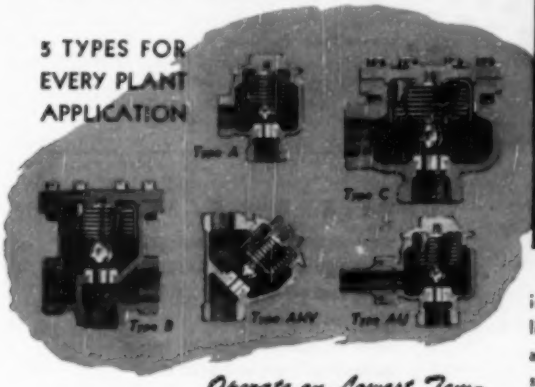
Stop COLD BLOW IN UNIT HEATERS

with Nicholson Steam Traps



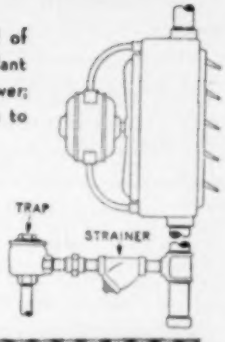
"Cold Blow" means condensate back-up in the heater. Remedy? A faster-acting drainage trap. And comparative tests by large trap users show the Nicholson prevents cold blow because they operate on low temperature differential: 5° to 15°, depending on trap size and steam pressure.

5 TYPES FOR EVERY PLANT APPLICATION



Operate on Lowest Temperature Differential . . . **NO WATERLOGGING**

Low temperature differential in the Nicholson steam trap is achieved by Nicholson's vapor-pressure-principle bellows. Extra large valve orifices provide great capacity. Thus, sudden load variations are quickly accommodated without condensate back-up. Valve stays open until steam arrives at trap. Their unsurpassed air-venting capacity also aid Nicholson traps in keeping equipment full of live steam. Types for every plant application: heat, process, power; size $\frac{1}{4}$" to 2"; pressures to 225 lbs.



At right is illustrated a typical hook-up of unit heater, Nicholson strainer and Nicholson trap. Send coupon for details of Nicholson's advanced features.

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Manufacturing Chemists for Over 100 Years

Chemical Economics

RICHARD F. WARREN, Market Editor

Chemical Engineering Survey Shows Chemical Industry Plans for a Big Year

What do leaders in the chemical industry think is in store for 1950? To get an accurate check on executive opinion, *Chemical Engineering* sent out a questionnaire late in 1949. As the year ended, returns came back with a cross-section of thought that is worth passing on to our readers. There were eight questions.

They were: (1) How much did your firm (or division) spend on new plant and equipment in 1949—How much do you plan to spend in 1950? (2) How did your sales and profits in 1949 compare with 1948? (3) How do you think your sales and profits in 1950 will compare with 1949? (4) What do you think were the biggest process and product developments in 1949? (5) Did any change or proposed change in law affect your industry in 1949? (6) What was your major supply-demand problem during 1949? (7) Do you expect any major price changes in 1950 that will affect your industry? (8) Did you have any trouble buying raw materials or selling your products?

Answers to the first question showed that there was a general trend toward cutting down capital expenditures in 1950. Twelve companies that spent $149 million on capital expansions during 1949 plan to spend $132 million for the same purpose in the current year. Since three of these companies made up about 30 percent of the total assets in the industrial chemicals branch of the process industries, the returns carry considerable weight. On a broader scale the McGraw-Hill economics department made a somewhat similar survey. The results of that survey showed that chemical companies spent $1.1 billion last year and that the total industry-wide expenditures this year are planned at $1.04 billion.

Answers on the second and third questions were less uniform. In the solvents field, profits were down sharply. One producer reported sales down about 10 percent and profits off even more. Another stated that percent change from 1948 would be meaningless in the case of sales and profits. However, solvent producers seem to feel that sales and profits this year will be equal to (or better than) 1949 levels. Producers making a wide range of chemicals were also optimistic. Returns showed that they felt that business should be at least as good as 1949 and profitwise it may be as much as 10-15 percent better.

On the heavy chemical front sales volume seemed to hold up fairly well, but profits slipped sharply. However, some alkali executives think sales and profits will be up more than 10 percent in 1950. Sulphur producers had a good year. But they do not think that this year will be as good—from either the sales or profit angle.

Suggestions for the biggest developments of the year ranged from the titanium metal developments, synthetic detergent growth, booming synthetic ammonium sulphate, down to general improvements in processes. Oxo alcohol and orlon also received prominent mention.

Legal problems bothering the industry came in for their share of discussion. The major chemicals mentioned in this regard were benzene and alkalis. The problems involving the chemical process industries are discussed in detail in the Law section of our annual review (see page 93.)

Biggest supply bottleneck reported in the survey was benzene. Several firms reported considerable difficulty in getting adequate supplies of this chemical. On the surplus side, selling caustic rated top billing. Both of these problems are discussed at length on pages 98-100. All in all, the returns point to a good year ahead.

Production Trends

Reports on chemical production are beginning to flow in on the last months of the year. The Bureau of the Census reports that November outputs of hydrochloric acid, synthetic ammonium sulphate, and hydrogen were the highest on record. Almost all heavy chemicals registered a gain over October operations. Among the most important were sulphuric acid, ammonia, ammonium nitrate, soda ash, caustic soda, chlorine, sodium sulphate and oxygen.

Antihistamines have grabbed the spotlight on medicinal chemicals. Sales leaped past the $50 million annual rate late in 1949. Start of sales for these drugs without a prescription explains the feverish buying; a host of trade-named products are in the market for over-the-counter sale. But some pharmaceutical makers are leery of possible headaches for producers—if the sedative effects and other side reactions are not reduced or eliminated. Lederle, Parke Davis, Hoffman La Roche and Ciba have been producing these allergy medicines for some time as prescription medicines.

Lederle has cut back penicillin production to concentrate on aureomycin. Production of this new antibiotic got under way in 1949. Demand still exceeds supply.

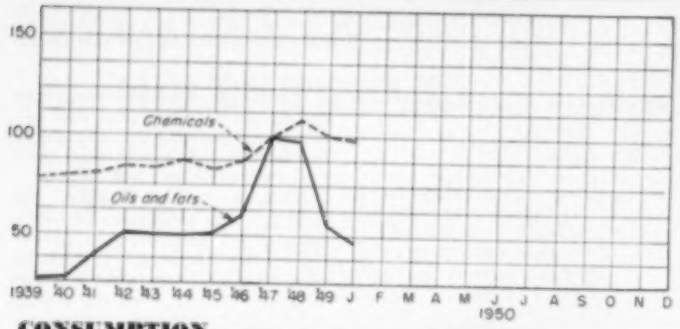
Penicillin and streptomycin continued to head the production parade of antibiotics. By October, penicillin output had passed the total 1948 production mark. In October streptomycin broke the record set in August and annual output climbed to 83 million grams.

Price Trends

This month *Chemical Engineering* presents its revised price indexes. They are designed to keep our readers up-to-date on the latest trends in prices and are set up with 1947 as the base year. While the older base (1937) was still accurate there was a strong possibility that it would become less accurate in the future. Therefore, a more recent base year was selected. For details on the index see page 106. On the new base (1947) the chemicals dropped from 99.37 on January 1, to 98.94 on February 1. The oils and fats index rose from 48.19 on January 1, to 51.21 on the first of this month. For readers who want to compare these changes with the 1937 base year, here are the February 1 index numbers for the old index. Chemicals dropped to 120.73. Oils & fats climbed to 148.31.

PRICE, CONSUMPTION AND PRODUCTION TRENDS

PRICES

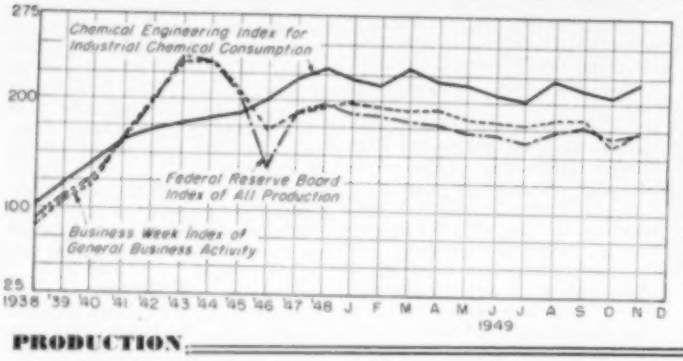


Chemical Engineering's Price Index
A month, a year, and two years ago

	Chemicals	Oils & Fats
As of February 1..	98.04	51.21
Last month	99.37	48.19
February 1949	104.19	65.45
February 1948	106.41	110.74

1947 = 100

CONSUMPTION

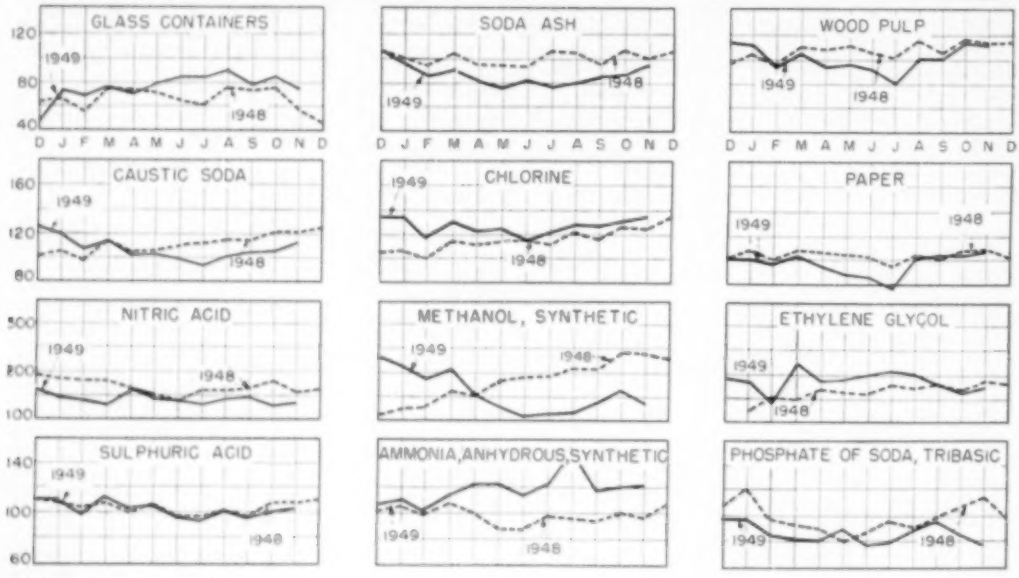

275
200
100
25
Chemical Engineering Index for Industrial Chemical Consumption
Federal Reserve Board Index of All Production
Business Week Index of General Business Activity
1938 '39 '40 '41 '42 '43 '44 '45 '46 '47 '48 J F M A M J J A S O N D
1949

Chemical Engineering's Consumption Index for Industrial Chemicals
(A breakdown by consuming industries)

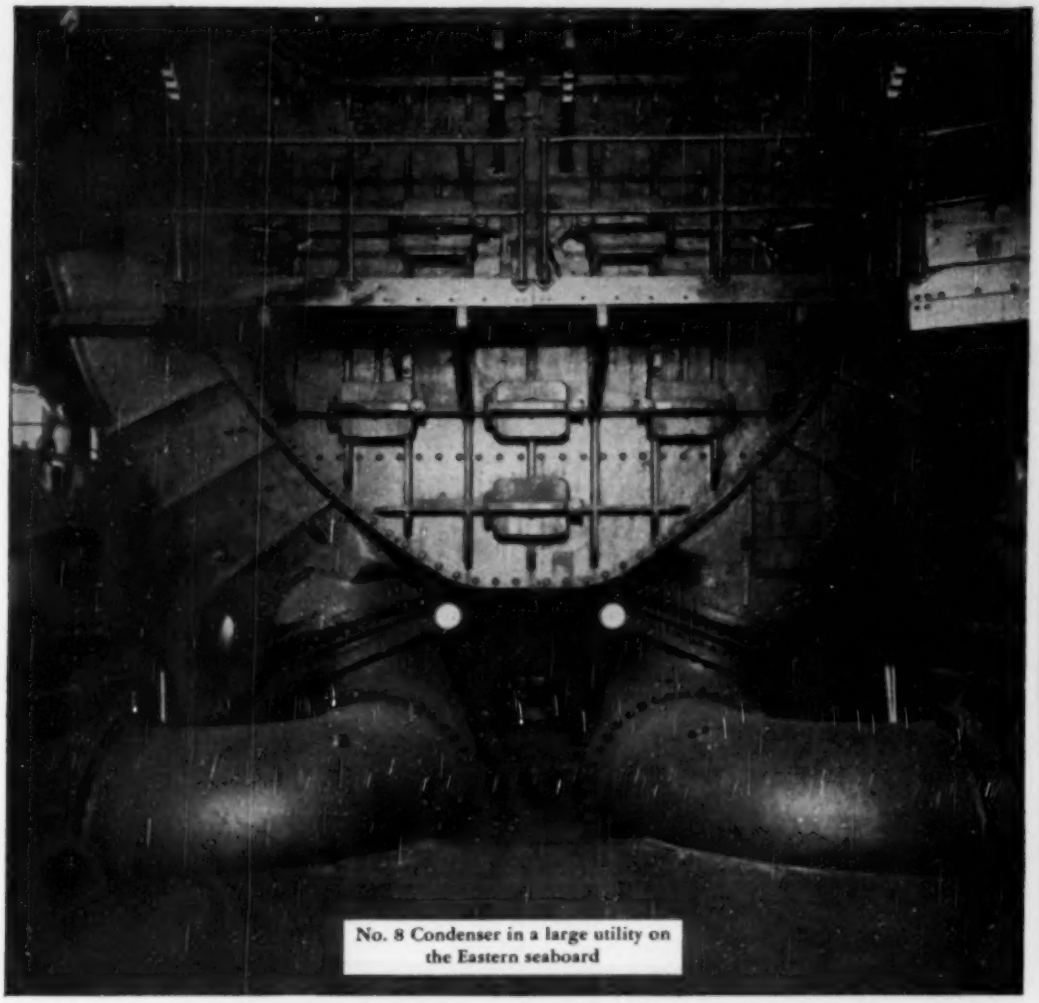
	October (Revised)	November
Fertilizers	49.20	51.20
Pulp and paper.....	24.99	25.25
Petroleum refining..	21.60	20.75
Glass	19.32	17.85
Paint and varnish...	21.05	19.50
Iron and steel.....	1.68	8.73
Rayon	25.90	26.81
Textiles	10.42	10.45
Coal products	3.02	10.56
Leather	4.29	2.97
Explosives	5.92	7.12
Rubber	4.86	4.83
Plastics	12.09	13.19
INDEX	204.34	220.21

1935 = 100

PRODUCTION



100=Monthly Average 1947



No. 8 Condenser in a large utility on the Eastern seaboard

don't let FOULING get your figures ALL FOULED UP!

● One important factor taken into account when figuring on the heat-transfer capacity of a condenser is fouling. But the effect of the tube alloy on both rate and amount of fouling is sometimes ignored in design calculations. The acceptance test of a condenser is made with clean tubes. However, the average heat transfer rate varies with time, and fouling is the chief factor in such variation. In many applications this indicates the need for serious consideration of cupro-nickel tubes, which are recognized to have superior anti-fouling characteristics, as well as high resistance to corrosion, erosion, impingement. Thus it can be said that cupro-nickel, 30%, will provide more uniform transfer rates over a period of time, require cleaning much less often, and last longer . . . Revere makes condenser tubes in cupro-nickel as well as in all the other customary copper alloys. We will gladly collaborate with you in a study of the economics of condenser tube selection to meet your needs for true economy. Write for reprint of article entitled "What Factors Should You Consider in Selecting Condenser-Tube Alloys?"

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lauryl bromide

$$CH_3-(CH_2)_{10}-CH_2-Br$$

Lauryl Bromide, one of many bromides offered by Dow, is used in the manufacture of quaternary ammonium compounds and in other organic syntheses.

PROPERTIES:

An amber liquid.	
Molecular weight	249.2
Boiling range at 10 mm. Hg, 5-95%	136.6-193.5°C.
Specific gravity at 25/25°C.	1.021
Freezing point, below	−40°C.
Refractive index at 25°C.	1.457
Flash point	144°C.
Fire point	168°C.

SOLUBILITY: (approximate), grams per 100 grams solvent, at 25°C.:

Acetone	∞
Benzene	∞
Carbon Tetrachloride	∞
Ether	∞
n-Heptane	∞
Methanol	11
Water	<0.1

THE DOW CHEMICAL COMPANY MIDLAND, MICHIGAN

Send for Experimental Sample of LAURYL BROMIDE

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Dept. D
Midland, Michigan

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Company _____

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City _____ State _____

DOW

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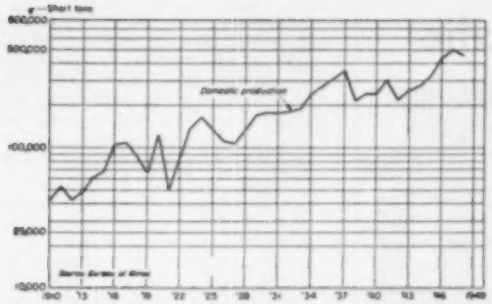
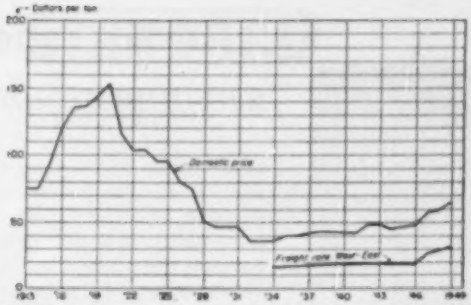
INDISPENSABLE TO INDUSTRY AND AGRICULTURE



Demand has pushed production up. We have world's top output.



Prices dropped as volume grew. Freight costs are changing that.

Commodity Survey:

BORAX

Half of it goes into glass and other ceramics. The rest of it is scattered among a hundred small uses.

M. H. PICKARD, *Pacific Coast Borax Co., New York, N. Y.*

The borax industry in the United States supplies major proportion of the world's borate requirements. This was made possible primarily through the efforts of the Pacific Coast Borax Co. in the Death Valley and Kramer District and the American Potash and Chemical Co.'s activities at Searles Lake. The Columbia Chemical division of the Pittsburgh Plate Glass Corp. with plants on Owens Lake, Calif., are active producers. Spasmodic activities have also been carried on at Lang and Fraser Mountain in California, at Muddy Mountain and White Basin in Nevada.

Since the deposits worked by these two concerns have been of radically different types, refining processes[1] are dissimilar. The operations of the Pacific Coast Borax Co. have involved the mining and refining of ores containing such borate minerals as colemanite ($2CaO,3B_2O_3\cdot5H_2O$), ulexite ($2CaO,Na_2O,5B_2O_3\cdot16H_2O$) and at present, kernite (rasorite) ($Na_2B_4O_7\cdot4H_2O$), and tincal ($Na_2B_4O_7\cdot10H_2O$). The last two are the sodium salts or the natural sodium tetraborate minerals. This explains why, on the discovery of the Kramer District, the mining of the colemanite and ulexite minerals in Death Valley was stopped and the new Kramer District deposits opened up. Mining, milling, and refining are all involved in the processing of the ores from those mineral deposits.

The recovery of borax from the Searles Lake deposit involves the pumping of a brine of complex chemical composition from the crystal magma of the lake and the separation of the borax from numerous other soluble salts of sodium and potassium contained in the brine.

The growth of the borax industry is exemplified in the accompanying curve. From a production of 12 tons in 1864 to that of 501,935 tons reported in 1947.[2] The 1948 output was 450,932 tons. One comment should be made concerning these figures. Up to and including 1942, published reports show short tons of boron minerals. Beginning with 1943, gross short tons of boron minerals are reported as well as tons of B_2O_3 contained therein which, in turn, have been converted to tons of borax.

PRICES REFLECT COMPETITION

The price curve, showing fluctuations in the early years, highlights the trials and tribulations experienced by the industry in moving from one small deposit to another. Each change forced modifications in process, to cope with the type of ore or minerals encountered. Keen competition of the different companies also contributed to these price changes. Improved economies in processing, protective tariff, the discovery of large deposits, and an increasing demand justified and made imperative, larger and more efficient mining, processing and transportation facilities, thus stabilizing the industry. Since the turn of the century, excepting World War I with its postwar period, these improved facilities have gradually brought the price of borax down to the level and status of other heavy chemicals. In recent years, this downward trend has been affected slightly by increased operating costs and more substantially by pronounced increases in transcontinental freight tariffs.

The industry now offers borates in commercial quantities varying in purity from several ore concentrates containing a B_2O_3 content from 34 percent to 62 percent (hydrated borax equivalent of 93.16 percent to 169.8 percent) through refined borax, and boric acid of both technical, USP, special quality grades, anhydrous borax, anhydrous boric acid, ammonium biborate, ammonium pentaborate, sodium metaborate, sodium perborate, manganese borate, calcium borate and zinc borate. Various metallic fluoborates, boron trifluoride, boron trichloride, and their ethers can be obtained. A number of metal borates can be secured in lesser quantities. Ethyl, methyl, and butyl borate also are available. The prime producers offer borates with extremes in purity represented by the ore concentrates on the one hand to the special quality grade on the other, which is of such low chloride content that the perspiration from the hand will contaminate the material. In the development of the industry, no market has been forgotten. The Indian or Chinese silversmith can still buy the large lumps of crystal borax his forebears used.

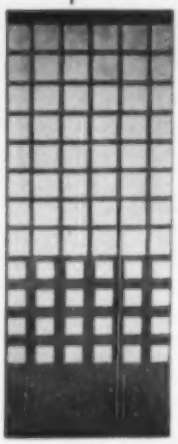
GLASS AND CERAMICS TAKE HALF

A breakdown of the end uses of domestic borate production, expressed in percent of B_2O_3 shows that glass and ceramics take 50 percent. Balance of some 100 or more industrial applications consume from 0.1 percent to 4.0 percent.

Use history of borax is like that of many other chemicals. In 1864, its

(Continued)

To meet **specific** *screening requirements*



Hendrick makes screens to specifications for all kinds of screening processes. The illustration shows a typical example—a flux screen made for a well known chemical company. Note the two different sizes of perforations in the same plate. Hendrick has made these screens with perforations ranging from 5" x 5" to 7½" x 7".

Write us regarding your screening requirements and we will gladly give you the benefit of our seventy-odd years of screen-making experience.

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ASCO Solenoid VALVES

Stainless Steel "Sanitary" Valve Type—DJQ

This particular ASCO Solenoid Valve is ideal for controlling the flow of material in connection with batching operations. Coupled with its "cleanability" feature is its reliability. Fully automatic, it opens and stays open as long as the coil is energized; it closes and stays closed when it is de-energized. Several pipe sizes available.

Write us about your automatic control problem in connection with the flow of liquids or gases, mentioning size of pipe, nature of materials and pressure. If this valve doesn't fit the picture, we have scores of other designs from which to select.

ASCO Solenoid VALVES

When in need of Automatic Transfer Switches, Remote Control Switches, Contactors, Relays, and Specialized Electromagnetic Controls, come to us.

Automatic Switch Co.

381 LAKESIDE AVENUE · ORANGE, N. J.

price varied from 39c. to 50c. per lb. Its principal market was the medicinal field and as a jewelers' flux. As borax became more available and its cost less prohibitive, new uses were developed. Either borax, boric acid, or one of its salts have been or are being used in diversified ways varying from a mildly antiseptic wash for babies' eyes, a sterilant for their nursing bottles, and rinse for their diapers, to a general detergent, constituent of soaps, soap powders, special cleaners, alkali in the leather tanning industry, constituent in leather and textile finishing compounds, flux for jewelers, welding and brazing fluxes, essential component of heat resistant pyrex type glass, a minor constituent in container glass, optical glass; in porcelain enamels, shoe polishes, pottery glazes, stabilizer for certain type dyes, pigments, an ingredient in denture cleaners, tooth powders, mouth washes, fireproofing agents, a minor element in commercial fertilizers and hence a minor mineral in our foods, a herbicide, poultry remedies, food preservative under certain restrictive conditions, electrolytic condensers, fluxes in metal melting and refining, corrosion inhibitors, insecticides, fungicides, bacteriacides, wood preservatives, cosmetics, medicines, adhesives, pastes and glues, paper sizing, fuels, fireproofing paints, abrasives, bleaches, ferrous and non-ferrous alloys, electroplating solutions, emulsifying agents, permanent wave solutions, and many other uses.

The list of end uses indicates the versatility of the boron compounds. Research is finding many new boron compounds for application development. Elemental boron is still a mystery. It is difficult to prepare in the free state and thus little is known of its behavior in this form. Few organoboron compounds have been developed.

A favorable supply situation backed up by adequate raw material reserves plus the possible variety of borate compounds should assure the industry of an ever widening market.

BACKGROUND

A curious and observant prospector walking along the shores of Clear Lake in Lake County, Calif., in 1859, found crystals of a salt which were identified as borax. There, five years later, in 1864, the domestic borax industry took its first step. Although borax had been found in certain spring waters near Red Bluff, Calif., as early as 1856, there seems to be no reference to any significant production from this source. The infant industry really started to walk when a deposit was dis-

covered at Teales Marsh, Nev., in 1872. This deposit was worked profitably for several years. Other deposits were discovered and worked at Rhodes Marsh, Nev., and Searles Marsh, Calif. Later, the discovery made in Death Valley, Calif., firmly put the industry on its feet. The discovery of a more accessible deposit of colemanite in the Calico Mountains near Daggett, Calif., was developed and became one of the major borate producing areas of the world. When this deposit was worked out, mining was again resumed in Death Valley and on a much greater scale. A railroad was constructed by the Pacific Coast Borax Co. to replace the 20-muleteams which had been the only means of transporting the ore out of the desert to existing railheads. These borate of lime deposits were worked until the natural sodium borate ores were discovered in the Kramer District of the Mojave Desert in Kern County, Calif., which is now one of the two major producing areas of the world.

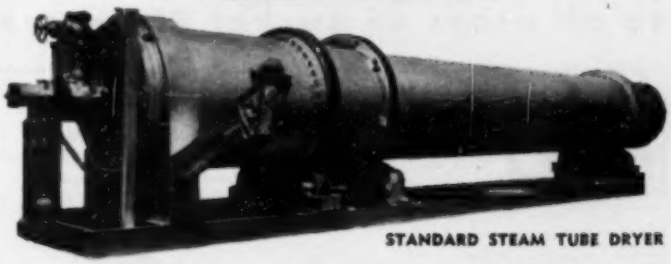
About the same time a lake deposit was discovered and its potential value was recognized, since the salts occurring there were found to contain borax as well as numerous other salts. In 1878, the San Bernandino Borax Mining Co. was organized and produced borax from the Searles Lake brines until 1895. Activities were discontinued until 1908 when the California Trona Co. made an unsuccessful attempt to produce soda ash from the brines. In 1913, the American Trona Co. (now the American Potash and Chemical Corp.) was organized and as a result of the efforts of their technicians and their ability to make the phase rule do a hop, skip and a jump, a process was developed and a modern refinery constructed where borax and the other salts are separated from a complex brine. The development of the Searles Lake deposit accounts for the other major borax producing area.

FOREIGN DATA INCOMPLETE

The foreign production figures are those available from the Bureau of Mines and are not too complete, due to lack of statistics. Chilean production not included for 1907 and 1908 and period 1909 to date. Bolivia only for 1901 to 1905 inclusive. Peru shows no production since 1928. The Argentine production was very small with the exception of period 1936 to 1944 with total of 82,409 short tons. Turkey has been constant in its production since 1894 reporting as high as 26,455 short tons in 1923 and 1924. Italy likewise, has a constant production of boric acid and averaged better than 3,000 tons yearly from

(Continued)

STANDARD



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DRYERS — DRYERS — DRYERS

STANDARD Rotary dryers are used throughout the world. STANDARD dryers are competently engineered and sturdily built in a wide variety of types and sizes for drying various products, such as fish meal, garbage, tankage, humus, fertilizer, sewage, sludge, agricultural products and countless chemicals. Stock designs available in sizes of 2 feet to 10 feet diameters. Let our engineers help you with your problems—regardless of your location.

We welcome your inquiries.

STANDARD STEEL CORPORATION

Engineers—Manufacturers

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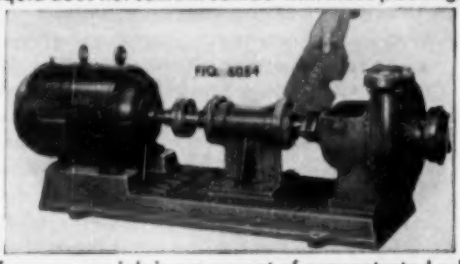
FUMES SEALED IN!

Chemical fumes cannot leak through the stuffing boxes in Taber Chemical Pumps because the load liquid does not come in contact with these packings.



If your pump job is movement of concentrated sulphuric or other fluids, please write on your letterhead for a copy of our Special Bulletin V-837 which details the dependability of Taber Pumps including those for mounting in processing and storage tanks, or in vessels sealed against fumes or gases.

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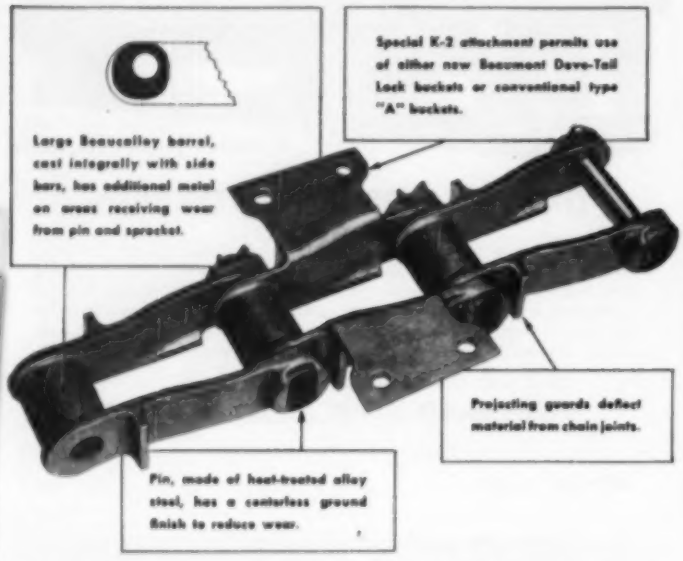
TABER Higher Practical Performance PUMPS

ANNOUNCING!

to all users of Bucket Elevators


Special K-2 attachment permits use of either new Beaumont Dove-Tail Lock buckets or conventional type "A" buckets.
Large Beaucalloy barrel, cast integrally with side bars, has additional metal on areas receiving wear from pin and sprocket.
Projecting guards deflect material from chain joints.
Pin, made of heat-treated alloy steel, has a centerless ground finish to reduce wear.

The New "Beaucalloy" Elevator Chain

This *NEW* Beaumont "Beaucalloy" Elevator Chain cuts maintenance costs through *great increase in service life.*

"BEAUCALLOY" Chain represents the result of an extensive program of development in materials and design, followed by severe installation testing. At present test installations, Beaumont "BEAUCALLOY" Chains have been in operation more than twenty times longer than former malleable iron chain—*and still show little sign of wear.*

In addition to utilizing Beaucalloy, a heat-treated alloy steel, Beaumont developed a new link design which provides additional metal on the barrel where wear occurs. In addition, the chain folds into place and maintains almost steady contact throughout rotation on sprocket or traction wheel—reducing wear on barrel, pin and sprocket.

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1867 to 1924 then increasing up to 6,830 tons in 1938 which is last year of record statistics used. The reports for 1945 to date are most incomplete.

Borax Facts and Figures

	Production of Borates (short tons) Domestic[4]	Foreign[4]	Price[4] (N. Y.) $ per ton
1864	12	568	$780
1865	135	7	780
1867	220	2,612	710
1869	0	2,651	604
1870	0	1,780	704
1872	140	3,080	640
1874	2,000	2,558	284
1876	2,500	2,806	217
1877	1,854	3,060	195
1878	1,401	4,141	177
1879	792	3,603	180
1880	1,846	4,311	240
1881	2,028	6,615	275
1882	2,118	8,312	275
1883	3,250	7,226	295
1884	3,500	5,563	195
1885	4,000	4,302	165
1886	4,669	5,561	135
1887	5,500	8,447	115
1888	3,795	5,291	140
1889	4,000	7,161	180
1890	4,750	7,681	150
1891	6,600	12,482	150
1892	6,750	6,528	150
1893	4,350	9,550	150
1894	6,559	21,934	140
1895	6,753	22,923	110
1896	13,569	26,932	100
1897	19,430	32,901	120
1898	15,334	31,549	140
1899	24,098	41,130	140
1900	25,937	38,632	140
1901	23,231	33,991	145
1902	20,004	35,291	145
1903	34,430	35,744	145
1904	45,947	38,088	145
1905	46,334	39,851	130
1906	58,173	48,114	130
1907	52,850	52,176	120
1908	25,000	57,485	90
1909	41,434	54,230	85
1910	42,357	45,629	70
1911	53,330	55,778	70
1912	41,315	52,426	70
1913	58,045	61,254	73
1914	62,399	40,086	73
1915	67,003	19,916	95
1916	103,524	17,894	125
1917	108,884	3,456	140
1918	86,794	3,303	145
1919	66,146	21,219	155
1920	120,318	35,466	165
1921	49,999	36,164	120
1922	85,219	51,953	105
1923	136,649	69,150	105
1924	166,109	68,316	95
1925	133,699	66,034	95
1926	115,686	64,290	80
1927	109,979	47,294	75
1928	130,998	42,418	80
1929	169,869	19,964	47
1930	177,358	11,387	47
1931	178,547	13,593	47
1932	181,911	12,760	38
1933	188,051	15,502	38
1934	242,497	16,478	38
1935	272,964	19,056	40
1936	313,743	20,822	40
1937	358,895	23,603	42
1938	215,662	11,810	43
1939	345,286	17,151	43
1940	243,357	6,422	43
1941	301,305	18,036	43
1942	226,723	5,850	46
1943	256,633+	8,376	46.03
1944	277,586+	6,685	45
1945	325,935+	———	45
1946	430,689+	———	46.03
1947	501,935+	———	55.91
1948	450,932	———	89.44
1949	———	———	66.46

REFERENCES

1. *Encyclopedia of Chemical Technology.* Vol. 2, Interscience Encyclopedia, Inc., New York, 1948.
2. *Minerals Year Book 1947.*
3. *Third Annual Report of the State Mineralogist of California.*
4. U. S. Bureau of Mines Reports and *Minerals Yearbooks.*
5. Ibid. and the *Mineral Industry of the British Empire* and Foreign Statistical Summaries.
6. Prices: 1864 to 1871, J. E. Bailey, *The Saline Deposits of California,* 1902; 1872 to 1909, *The Mineral Industry;* 1909 to 1949, *Oil, Paint and Drug Reporter.*

Chemical Progress

News of developments from General Electric's Chemical Department that can be important to your business.

Photo courtesy Northwest Airlines, New Stratocruiser

G-E Silicones Put Raincoats on Ignition Systems. A General Electric research development in the field of organo-silicon chemistry, G-E SILICONE COMPOUND 81083, now makes possible a chemically stable waterproof seal for ignition systems in aircraft, marine engines, electronic equipment—even in automobiles where humidity conditions create problems. This amazing material eliminates the danger of voltage loss *under high humidity conditions, within a temperature range between —70F and 450F.* A grease-like material, it is applied to cable insulation and is used to fill spaces around high-voltage connections.

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ANGLE FOR ANGLERS—Newest thing for fishermen is the magnetic fly box, designed and plastics molded by G.E. for a New England manufacturer. This novel box incorporates magnets which hold the anglers' flies in place even in breezy weather.

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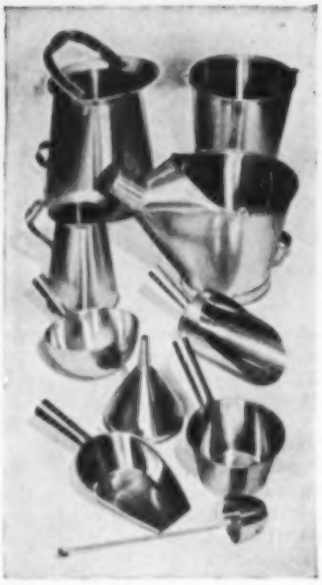

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United States Production of Certain Chemicals

Chemical (Tons unless otherwise noted)	October 1949	October 1948	September 1949	September 1948
Ammonia, synthetic, anhydrous	108,804	93,791	105,443	89,062
Ammonium nitrate	70,984	84,128	85,906	79,942
Ammonium sulphate, synthetic (M lb.)	142,798	39,600	123,763	38,816
Calcium arsenate (M lb.)	.....	.....	.....	.....
Calcium carbide, commercial	47,374	37,805	40,286	33,184
Carbon dioxide:				
Liquid and gas (M lb.)	19,254	17,998	20,735	24,393
Solid (M lb.)	62,985	53,145	74,390	79,965
Chlorine	151,139	147,263	147,214	136,382
Chrome green (M lb.)	1,431	1,061	1,281	1,152
Chrome yellow and orange, (C.P.) (M lb.)	4,404	4,080	.....	.....
Hydrochloric acid	43,616	39,863	41,090	37,625
Hydrogen (mil. cu. ft.)	2,906	2,863	3,331	2,996
Lead arsenate, acid and basic (M lb.)	.....	.....	.....	.....
Molybdate chrome orange, (C.P.) (M lb.)	794	526	617	397
Nitric acid	85,206	90,190	95,721	95,570
Oxygen (mil. cu. ft.)	820	1,431	1,174	1,279
Phosphoric acid (50 percent H_3PO_4)	130,479	113,357	111,782	106,304
Soda ash:				
Ammonia-soda process:				
Total wet and dry [3]	328,989	405,633	317,406	357,618
Finished light [4]	163,904	193,269	167,962	167,340
Finished dense	114,280	146,431	118,101	132,123
Natural [5]	20,786	25,328	19,913	24,712
Sodium bicarbonate, refined	15,272	14,497	11,980	13,376
Sodium bichromate and chromate	5,598	6,490	5,552	6,209
Sodium hydroxide:				
Electrolytic process:				
Liquid [6]	144,243	144,380	139,686	133,986
Solid	18,230	29,318	19,587	29,206
Lime-soda process:				
Liquid [6]	45,124	67,450	42,491	62,177
Solid	13,040	23,333	10,904	23,187
Sodium phosphates:				
Monobasic	1,289	1,251	1,328	1,085
Dibasic	13,306	9,259	11,927	8,282
Tribasic	6,153	5,256	6,580	5,836
Meta	2,682	2,452	3,426	2,452
Tetra	5,177	4,985	7,471	4,985
	49,912	38,232	37,130	38,232
Sodium nitrate, anhydrous				
Sodium sulphate:				
Anhydrous	12,199	15,956	9,712	13,703
Glauber's salt [7]	14,982	16,137	12,235	14,345
Salt cake [7]	41,184	60,674	37,130	38,232
Sulphuric acid: [8]				
Chamber process	891,394	286,174	212,910	210,220
Contact process, new	213,426	644,047	278,981	301,774

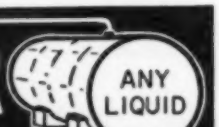
Data for this tabulation have been taken from "Facts for Industry" series issued by Bureau of the Census. Production figures represent primary production and do not include purchased or transferred materials. Quantities produced by government-owned arsenals, ordnance works, and certain plants operated for the government by private industry are not included. Chemicals manufactured by TVA, however, are included. All tons are 2,000 lb. Where no figures are given data are either confidential or not yet available. [1]Includes a small amount of aqua ammonia. [2]Total wet and dry production, including quantities diverted for manufacture of caustic soda and sodium bicarbonate, and quantities processed to finished light and finished dense. [3]Not including quantities converted to finished dense. [4]Data collected in cooperation with the Bureau of Mines. [5]Figures represent total production of liquid materials, including quantities evaporated to solid caustic and reported as such. [6]Includes oleum grades, excludes spent acid. [7]Data for sulphuric acid manufactured as a byproduct of smelting operations are included.

United States Production of Synthetic Organic Chemicals

	October 1949	October 1948	September 1949	September 1948
Acetanilid	273,985	.....	222,315	.....
Acetic acid,				
Synthetic [1]	38,067,199	35,957,360	33,196,069	33,476,646
Recovered	131,621,262	160,787,000	137,824,830	157,673,086
Natural [2]	1,300,452	2,384,170	1,901,517	1,980,757
Acetic anhydride [3]	60,704,244	69,585,130	62,927,250	69,230,940
Acetone	35,674,290	20,434,752	29,449,974	30,217,320
Acetylsalicylic acid	925,661	1,078,570	813,277	1,043,018
Aniline	6,860,396	7,242,613	5,468,423	6,043,018
Barbituric acid derivatives [4]				
5-Ethyl-5-phenylbarbituric acid and salts (phenobarbital)	.....	35,380	15,396	19,178

(Continued on page 276)

TANKOMETER



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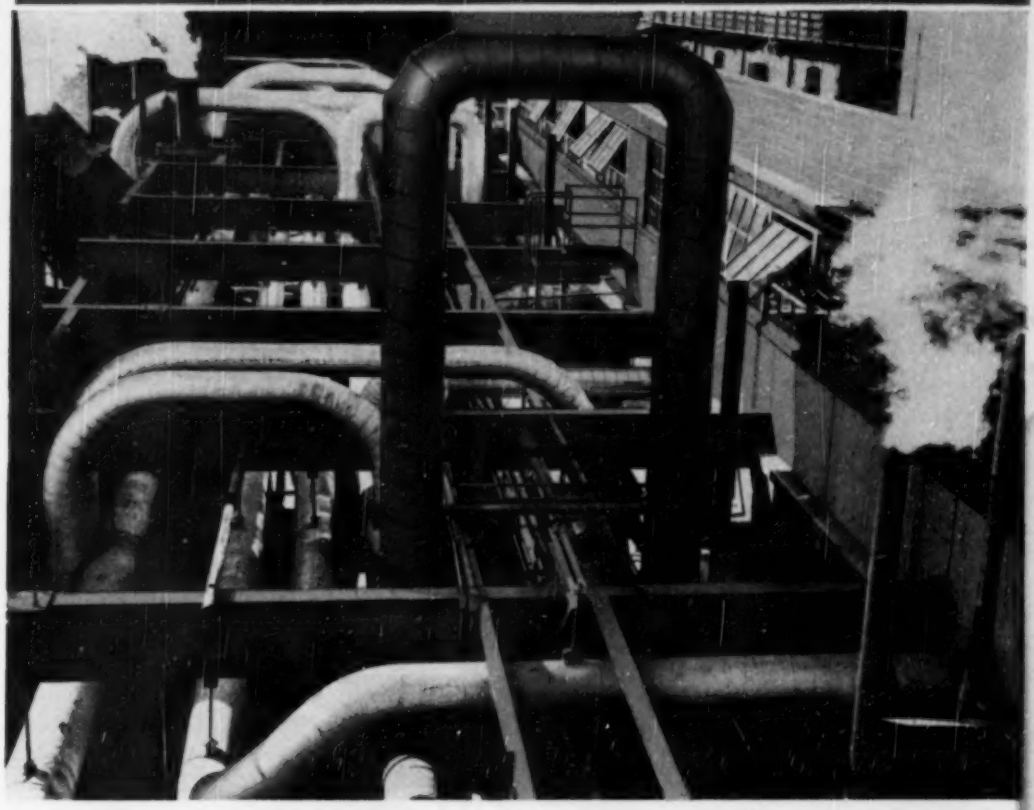

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The exclusive Foilclad construction of insulation and protective coatings guarantees long and trouble-free system operation for industrial users. For years Foilclad Insulated Piping Systems have been conveying all kinds of processing liquids in intricate but efficient piping networks.

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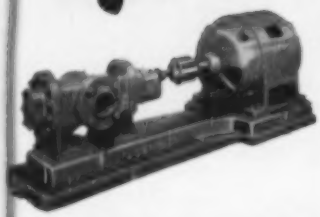
VISCOSITY means nothing to the SIER-BATH SCREW PUMP



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U. S. Production of Synthetic Organic Chemicals, cont. from page 274

	October 1949	October 1948	September 1949	September 1948
Benzene:				
Motor grade:				
Tar distillers	.....	.....	.....	.....
Coke oven operators	434,755	604,277	.....	696,582
All other grades:				
Tar distillers	765,807	1,060,807	761,677	958,890
Coke oven operators	2,430,349	13,289,171	.....	11,868,615
Butyl alcohol, primary, normal	10,489,812	14,483,925	10,086,762	13,057,430
Carbon bisulphide	32,516,136	35,926,315	30,643,559	30,091,362
Carbon tetrachloride	14,648,295	19,296,337	17,182,130	17,377,296
Chlorobenzene, mono	24,099,227	27,134,084	18,263,268	24,848,908
Creosote oil:				
Tar distillers[4]	5,295,023	9,194,179	8,882,908	9,594,451
Coke oven operators[5]	367,112	2,842,686	.....	2,898,711
Cresols, meta-para	480,087	791,504	394,447	980,290
Cresols, ortho-meta-para	.....	1,011,180	.....	998,204
Cresylic acid, refined[7, 16]	1,903,386	1,900,421	1,790,805	1,713,900
Dibutyl phthalate	1,844,233	1,845,424	920,054	891,731
Dichlorodiphenyltrichloroethane (DDT)	2,455,780	1,102,571	2,345,945	694,419
Ethyl acetate (85 percent)	5,051,778	5,807,901	5,230,551	4,920,523
Ethylene glycol	31,801,561	33,627,749	33,367,441	32,330,307
Ethyl ether	3,235,246	3,386,080	2,847,425	3,363,086
Formaldehyde, 37 percent by wt.	60,252,037	57,323,108	48,214,925	49,566,580
Hexachlorocyclohexane	2,234,627	1,447,278	2,736,170	1,281,320
Methanol, natural[8]	1,008,232	1,252,698	966,452	1,289,774
Methanol, synthetic	73,968,981	108,672,788	91,911,155	98,780,114
Naphthalene:				
Tar distillers, less than 79° C.	16,977,761	30,046,890	14,201,287	12,695,668
Tar distillers, 79° C. and over	5,773,878	7,625,907	5,444,376	7,344,346
Coke-oven operators, less than 79° C.	944,230	9,263,026	.....	9,863,814
Penicillin and salts[9]	11,947,066	8,620,536	11,465,342	6,110,780
Phenol	18,940,027	27,535,980	12,302,478	25,145,105
Phthalic anhydride	16,284,330	15,977,414	12,001,004	11,941,432
Styrene, government and private plant	33,972,580	32,075,906	30,409,456	29,310,054
Toluene:				
Coke-oven operators	743,865	2,435,550	.....	2,266,516
All other[3]	2,142,347	3,618,330	3,262,666	1,518,523
Xylene, crude	3,794,870	5,430,416	3,929,240	4,400,305

All data in pounds except benzene (gal.) creosote oil (gal.), toluene (gal.), xylene (gal.) and penicillin (million Oxford units). Statistics collected and compiled by U. S. Tariff Commission except where noted. Absence of data on production indicates either that returns were unavailable or confidential. [3]Excludes the statistics on recovered acid. [4]Acid produced by direct process from wood and from calcium acetate. [8]All acetic anhydride including that from acetic by vapor-phase process. [6]Product of distillers who use purchased coal tar only or from oil-gas or water-gas produced or purchased by tar distillers. [7]Statistics are given in terms of bulk medicinals only. [8]Statistics collected by Bureau of Mines. [9]Total production including data reported both by coke-oven operators and by distillers of purchased coal tar. [16]Reported to U. S. Bureau of the Census. [16]Includes toluene produced from petroleum by any process. [16]Includes refined cresylic acid from petroleum.

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NEW CONSTRUCTION

Proposed Work

Ill., Chicago—Barker Chemical Co., 2258 South Union St., has purchased an 18 acre site near here and plans to construct a new plant. Estimated cost $300,000.

Ill., Skokie—Lawter Chemical Co., 3550 Touhy St., plans to construct a 1 story, 75x130 ft. factory. W. Fred Daike, 189 West Madison St., Chicago, Archt. Estimated cost $70,000.

N. C., Valdese—Valdese Manufacturing Co., Valdese, plans to construct a dye house.

Tex., Baytown—Humble Oil & Refining Co., Baytown, plans to remodel and construct an extension to its refinery here. Estimated cost $2,500,000.

Tex., Beaumont—Socony-Vacuum Oil Co., Beaumont, plans to replace three of its catalytic cracking units at its refinery here. Estimated cost $2,500,000.

Tex., Houston—Stauffer Chemical Co., 420 Lexington Ave., New York, N. Y., and M. & M. Bldg., Houston, plans to construct a chemical plant. Estimated cost $1,500,000.

Tex., Quanah—Certain-Teed Products Corp., Quanah, plans to construct a mixture and packaging plant. Estimated cost $300,000.

Utah, Salt Lake City—Utah Oil Refining Co., Utah Oil Bldg., plans to construct a warehouse and storehouse building. Estimated cost $500,000.

Wash., Camas—Crown-Zellerbach Corp., Camas, plans to construct a sulphite recovery plant here. Estimated cost $6,000,000.

Wash., Everett—Soundview Pulp Co., Everett, plans to construct a plant to recover sulphite waste liquor from its pulp plant. Estimated cost $6,000,000.

Wash., Hoquiam—Rayonier, Inc., Shelton, plans to construct a plant to recover sulphite waste liquor from its pulp plant. Estimated cost $2,500,000.

Wash., Seattle—California Ink Co., 2627 Western Ave., plans to construct a warehouse and sales building. Estimated cost will exceed $65,000.

Wash., Seattle—Freedom-Valvoline Oil Co., 2204 First Ave., S., plans to construct a warehouse and mixing plant. Estimated cost $100,000.

W. Va., Moundsville—Fostoria Glass Co., Moundsville, plans to construct a 3 story, 90x120 ft. factory. Estimated cost $200,000.

Wis., Superior—Huron Portland Cement Co., 601 Griswold St., Detroit, Mich., plans to construct a grinding plant, storage silos and loading equipment. Project will cost several million dollars.

Alta., Edmonton—Edmonton Pulp & Paper Mills, Ltd., Edmonton, plans to construct a 200 ton daily capacity paper mill east of city and on the north side of the Saskatchewan River. Estimated cost $10,000,000.

	Current Projects		Cumulative 1950	
	Proposed Work	Contracts	Proposed Work	Contracts
New England	.....	.....	$2,000,000	.....
Middle Atlantic	.....	$100,000	.....	$200,000
South	$268,000	200,000	1,768,000	850,000
Middle West	2,370,000	6,898,000	2,370,000	6,898,000
West of Mississippi	6,800,000	3,316,000	20,800,000	3,216,000
Far West	15,108,000	342,000	15,108,000	2,342,000
Canada	10,300,000	1,190,000	12,300,000	1,190,000
Total	$34,906,000	$12,046,000	$54,406,000	$14,698,000

Man., Winnipeg—Hobbs Glass, Ltd., 57 York St., London, Ont., is having plans prepared for the construction of a warehouse and office. Estimated cost $100,000.

Ont., Toronto—British Oxygen Canada, Ltd., south of Horres Ave., Etobicoke Twp., plans to construct oxygen and acetylene factories and office building. Estimated cost $200,000.

Contracts Awarded

Calif., Los Angeles—General Paint Corp., 3990 East Washington Blvd., has awarded the contract for a new plant to Paul W. Speer, 4201 Sunset Blvd., at $259,922.

Calif., Redwood City—Pacific Portland Cement Co., Redwood City, has awarded the contract for the construction of a precipitation building, wallboard plant and spray rubber building at Redwood City Harbor to Peter Sorenson Co., 927 Arguello St. Estimated cost $82,500.

Fla., Jacksonville—Pure Oil Co., Talleyrand Ave., will improve and construct additions to its distributing plant. Work will be done with own forces. Estimated cost $200,000.

Ill., Chicago—General Paint & Varnish Co., 2023 North Mendell St., has awarded the contract for a new factory building to A. E. Anderson, 1244 East 79 St. Estimated cost $68,000.

Ill., Chicago—Pure Carbonic, Inc., 1805 South Stewart St., has awarded the contract for a 2 story addition to its plant to Abell-Howe Co., 53 West Jackson Blvd. Estimated cost $80,000.

Ill., North Chicago—Abbott Laboratories, Inc., Sheridan Rd., has awarded the contract for a 5 story pharmaceutical laboratory and warehouse to John Griffiths & Son Co., 228 North LaSalle St., Chicago. Estimated cost $1,800,000.

Minn., St. Paul—Waldorf Paper Co., 2260 Wabash Ave., has awarded the contract for a 1 story, 195x202 ft. addition to its plant to J. S. Sweitzer & Son, 739 Pillsbury Ave. Estimated cost $125,000.

N. M., Eunice—Gulf Oil Corp., Eunice, has awarded the contract for a gasoline plant to Younger Construction Co., Eunice. Estimated cost $465,000.

O., Cleveland—The Standard Oil Co., Midland Bldg., has awarded the contract for the design and construction of an extensive refinery modernization program to Bechtel Corp., 220 Bush St., San Francisco, Calif. Estimated cost $4,500,000.

O., Hamilton—American Cyanamid Corp., 30 Rockefeller Plaza, New York, N. Y., has awarded the contract for a sulphuric acid plant here to Chemical Construction Corp., 350 5th Ave., New York, N. Y. Estimated cost $450,000.

Pa., Glenshaw—Glenshaw Glass Co., Route 8, will construct a 1 story, 114x260 ft. warehouse. Work will be done by owner. Estimated cost $100,000.

Tex., Abilene—Onyx Oil Refinery, Abilene, will reconstruct portion of its refinery. Work will be done by owners with subcontracts. Estimated cost $80,000.

Tex., Cleburne—Limestone Products Co., Cleburne, plans to enlarge its plant. Work will be done by force account. Estimated cost $135,000.

Tex., Houston—Stauffer Chemical Co., M & M Bldg., has awarded the contract for the construction of a warehouse to Metallic Building Co., 4601 Holmes Rd. Estimated cost $116,000.

Tex., Port Neches—B. F. Goodrich Chemical Co., Port Neches, has awarded the contract for enlarging its plant for the manufacture of cold rubber synthetics to Jas. Stewart Co., Port Lavaca. Estimated cost $245,000.

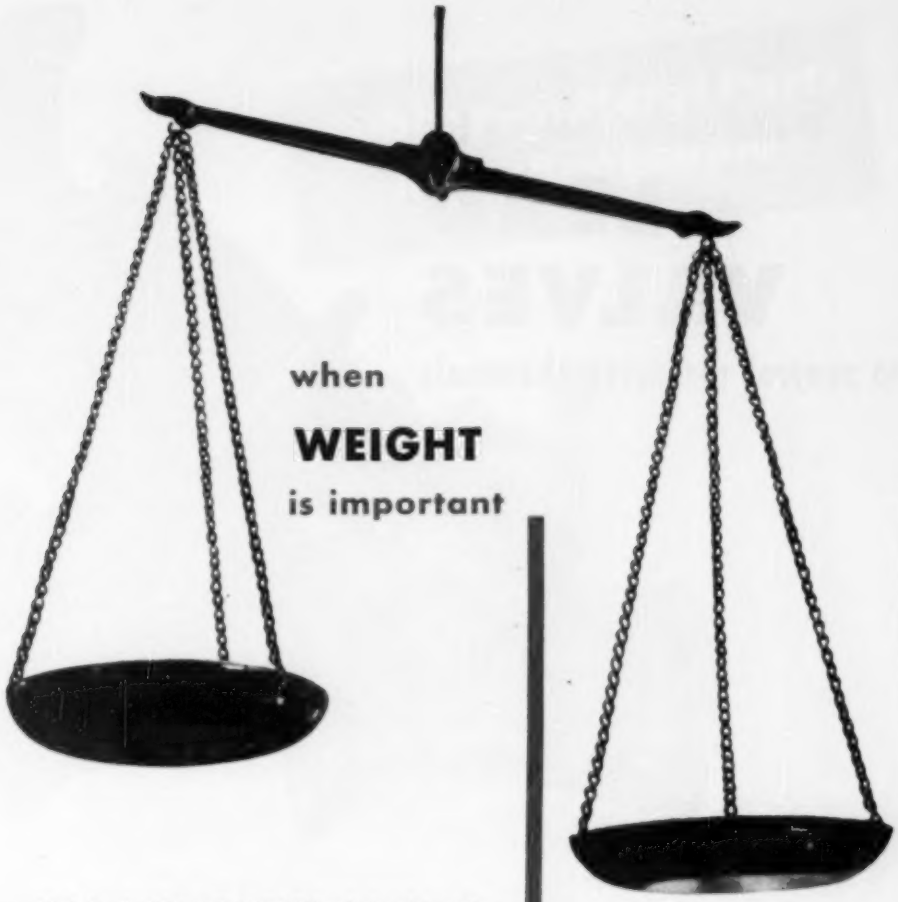
Tex., Sweetwater—United States Gypsum Co., Sweetwater, will enlarge its plant. Work will be done by force account. Estimated cost $1,000,000.

Tex., Tyler—McMurrey Refining Co., Tyler, has awarded the contract for a fluid catalytic cracking refinery to Universal Oil Products Co., Chicago, Ill. Estimated cost $1,150,000.

Ont., Hawkesbury—Canadian International Paper Co., Sun Life Bldg., Montreal, Que., has awarded the contract for the construction of a filter building and other improvements at its plant to E. G. M. Cape & Co., Ltd., 620 Cathcart St., Montreal. Estimated cost $1,000,000.

Ont., Welland—North American Cyanamid, Ltd., 1 Fourth Ave., Niagara Falls, has awarded the contract for remodeling its plant into pilot plant for experimental purposes to Frontier Eng. & Mfg., Ltd., 399 Buttrey St., Niagara Falls, Ont. Estimated cost $100,000.

Que., Montreal—Dominion Oilcloth & Linoleum Co., Ltd., 2200 E. Ste. Catherine St., has awarded the contract for an addition to its factory to J. L. Price Co., Ltd., 680 West Sherbrooke St. Estimated cost $90,000.



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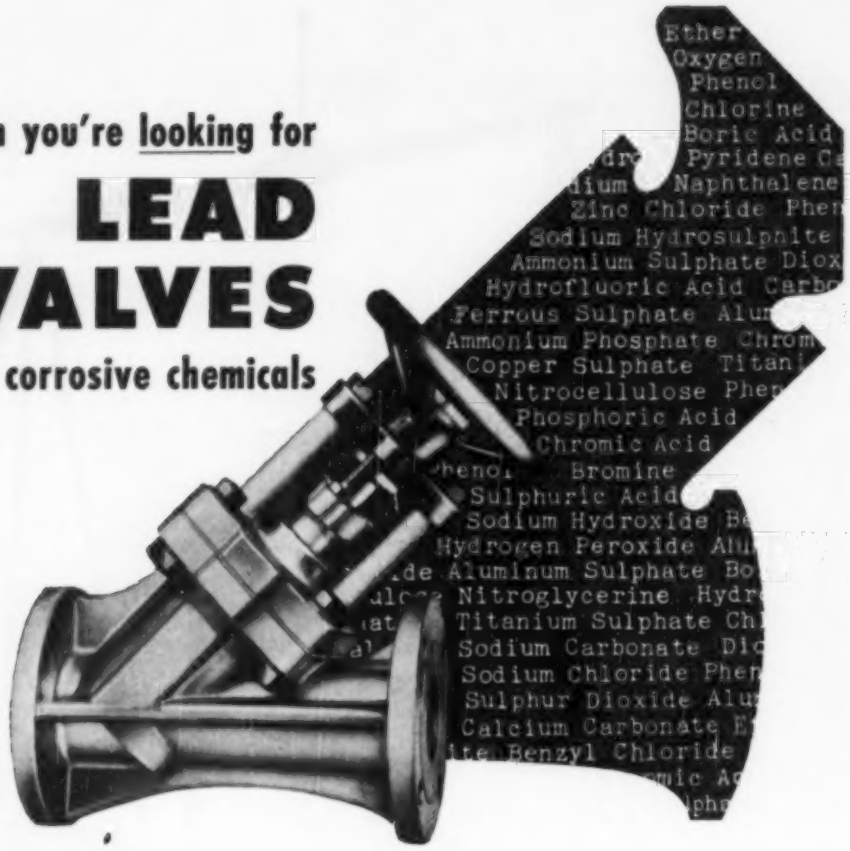

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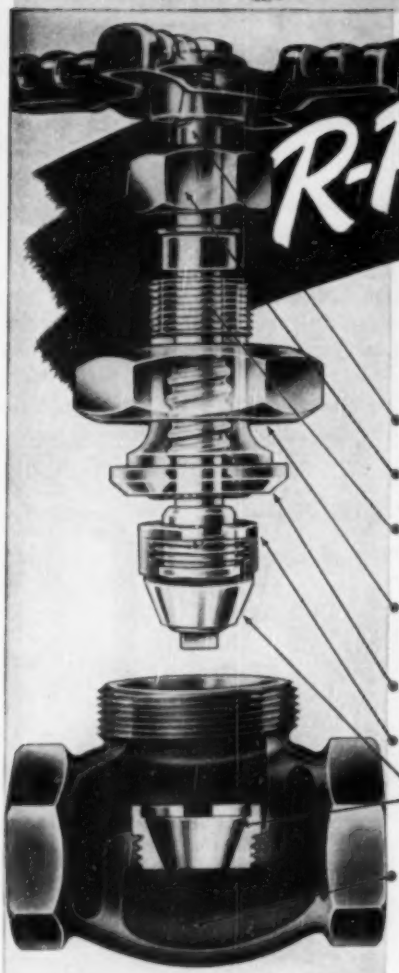

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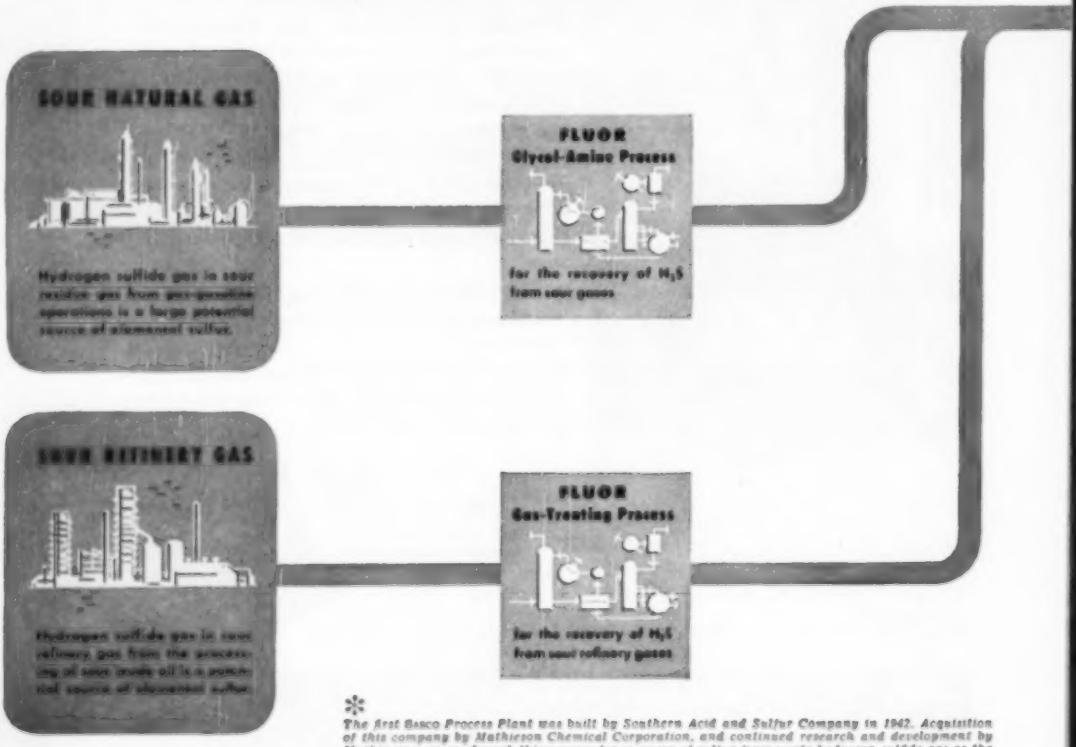
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*The first Sasco Process Plant was built by Southern Acid and Sulfur Company in 1942. Acquisition of this company by Mathieson Chemical Corporation, and continued research and development by Mathieson personnel mark this process for recovery of sulfur from waste hydrogen sulfide gas as the only one developed in the United States with a record of several years' successful operation.

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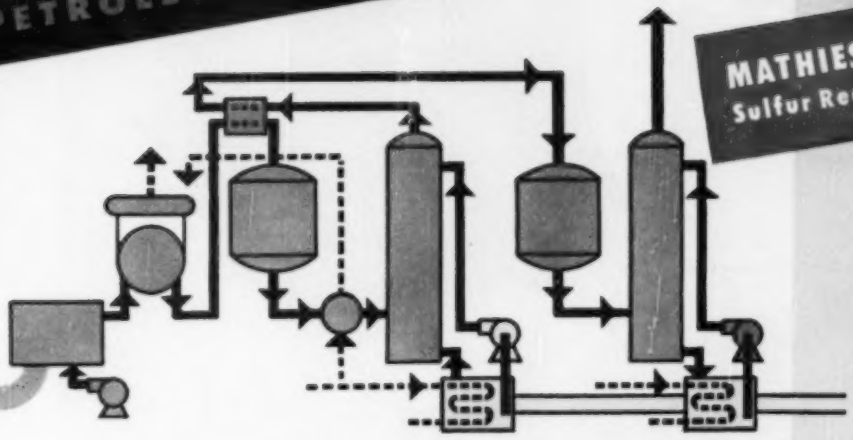

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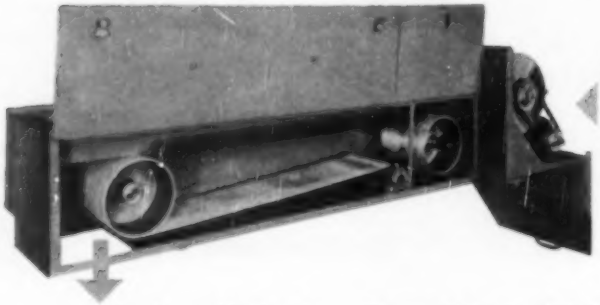

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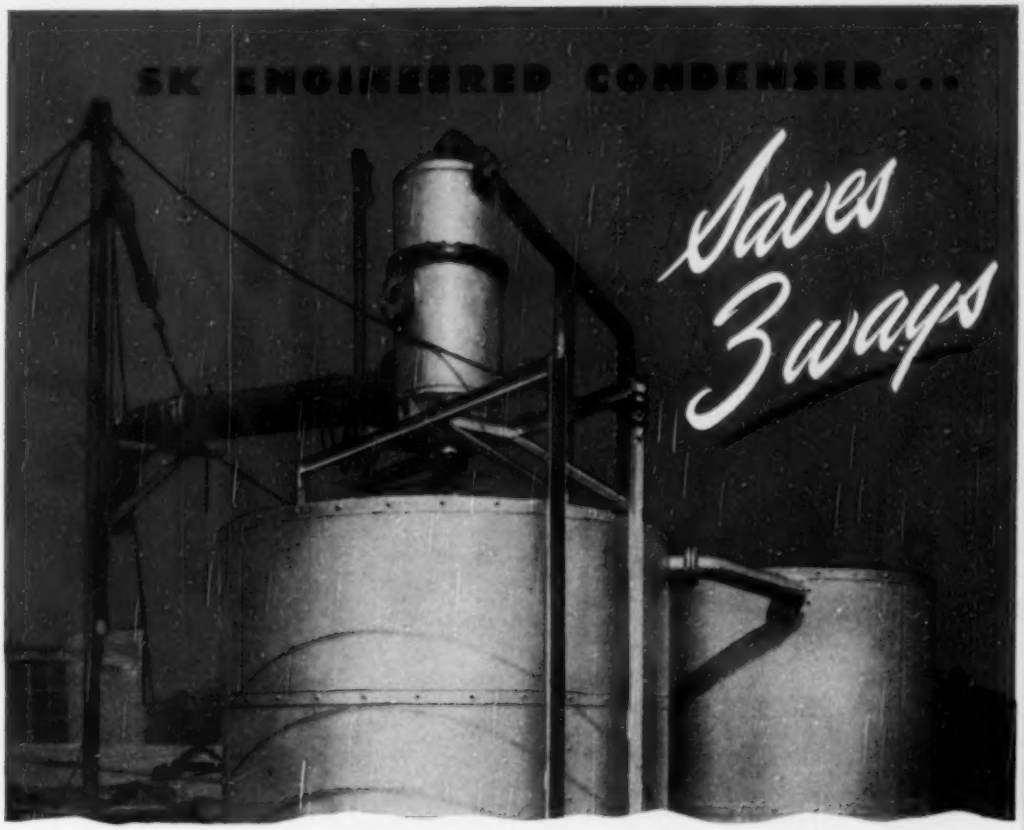

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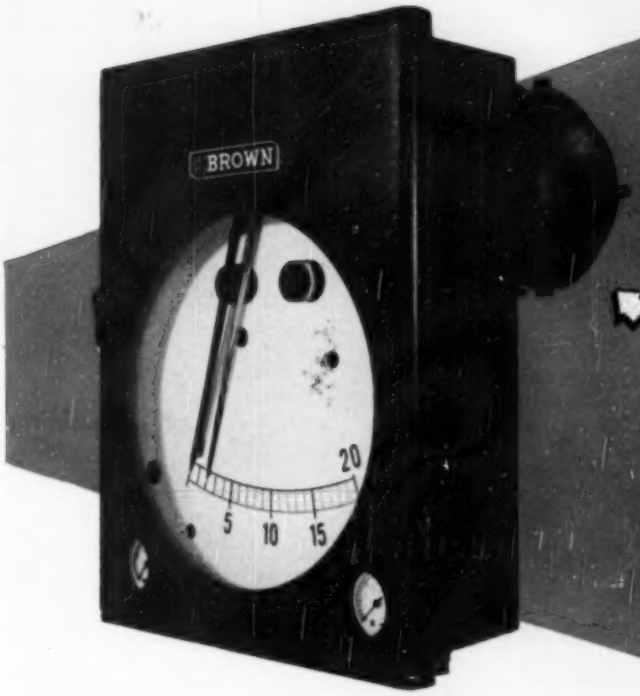

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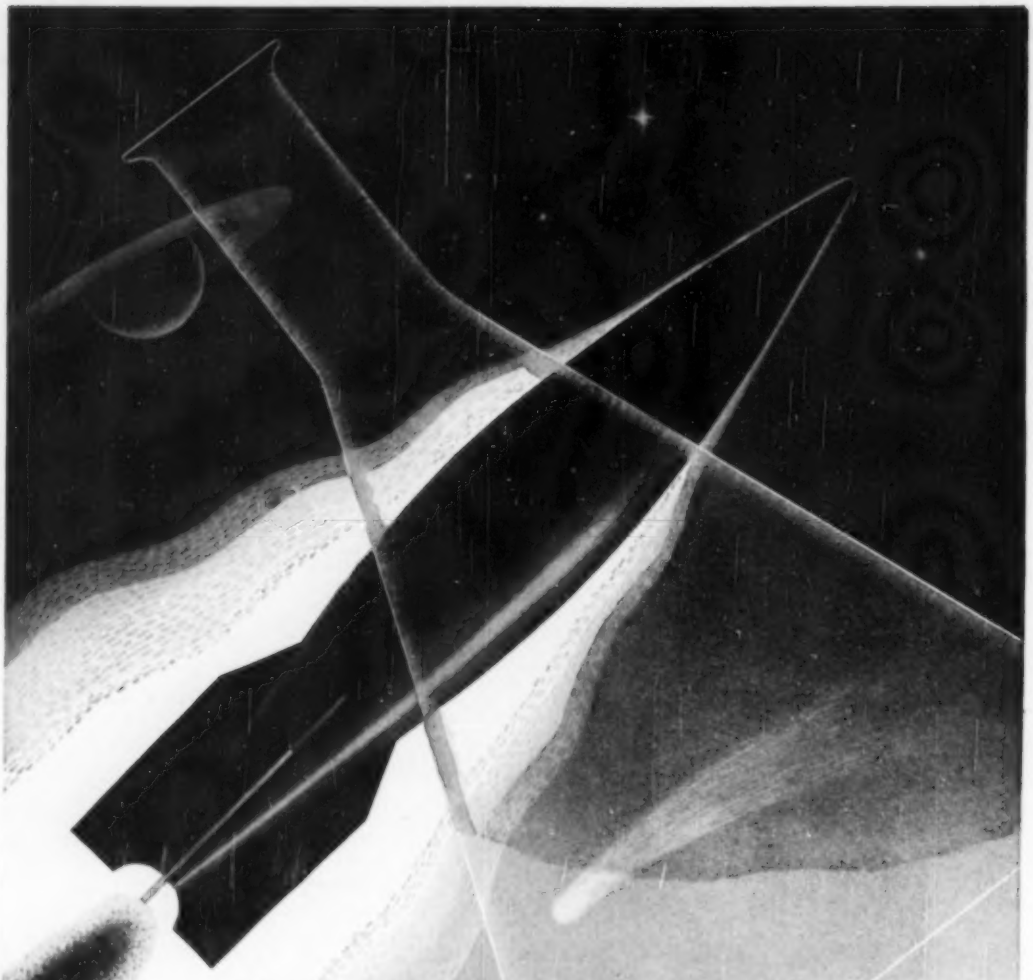

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1950 . . .
Our Industrial Machine Is Running Down

In his recent Economic Report to Congress President Truman chalked up a constructive advance in his economic reasoning. He pointed out that if we are going to attain the worth-while goal of a $300 billion national income in the next five years, we must equip ourselves with more and better industrial tools. Of all the dynamic forces of expansion in America, he said, one of the most important is business investment.

That is fine. It is basic common sense. We have been saying that for years and we are glad to hear the President say it too.

But having hit this new high in his economic reasoning, the President failed to draw the right conclusion. He made the mistake of accepting the false conclusion that there is no shortage of business funds to pay for more and better industrial tools. "There are immense opportunities for business investment in nearly every segment of the economy," the President said, and further, "there are in general sufficient funds available to businessmen who want to seize these opportunities."

That just is not so – and the lack is not only serious; it can well be fatal.

It is a matter of the most urgent national importance that the President's recognition of the need of more and better industrial tools should be followed by effective action. *That calls for changes in the national policies that are now blocking and, unless changed, will increasingly block business from meeting this need. If business cannot get enough new tools, the result will not be higher, but lower standards of living five years from now.*

The President should talk this matter of business investment over with Senator O'Mahoney, the Chairman of the Joint Congressional Committee on the Economic Report. Senator O'Mahoney would take to the discussion knowledge of the investment situation recently acquired through his conduct of a series of Congressional hearings.

If he told the President what he told the press during the course of these hearings, he would say, "the private capitalistic system is being seriously threatened by a lack of venture capital." That is in direct conflict with the President's conclusion that "there are in general sufficient funds available."

This serious shortage of adequate investment in new plant and equipment is brought forth so that all of us can understand it by McGraw-Hill's annual survey of American industry's plans for investment in new plant and equipment in 1950, which has just been completed.

continued on next page

BUSINESS' PLANS FOR 1950

These are the major findings of the McGraw-Hill survey of "Business' Plans for New Plants and Equipment" in 1950. Made by the McGraw-Hill Department of Economics, the survey shows:

1. Industry – as represented by manufacturing, mining, transportation, and utilities – now plans to invest $12.4 billion in new plants and equipment this year. This is 13% less than was actually spent last year.

2. Manufacturing industries alone plan to spend $6.3 billion in 1950 for new facilities. This is also 13% less than they spent last year.

3. Manufacturers as a whole expect their 1950 sales volume to about equal 1949's.

4. Manufacturers will expand their capacity about 3% in 1950, under present plans. The largest part of their funds, 65%, will go to replace and modernize existing facilities.

5. Profits and reserves are expected to provide 92% of the 1950 investment funds of manufacturing companies. These companies count on new common stock issues to provide less than one-half of one per cent of the investment funds they will need.

6. Two out of three manufacturing companies review their investment plans monthly. Almost all companies go over them at least quarterly. The survey shows that companies changed plans rapidly during 1949 to meet changes in their prospects.

7. Other industries are also reducing their investment plans in 1950 by 13%. This coincidence arises from the fact that utility companies, notably the electric light and power companies, plan to spend only slightly less than in 1949. Railroads, on the other hand, are reducing their capital programs in 1950 by more than 40%.

A copy of a complete report on "Business' Plans for New Plants and Equipment" may be obtained by writing me at McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York 18, N. Y.

The results of the survey, which are summarized above, show that American Industry – as represented by manufacturing, mining, transportation and utilities – is planning to spend 13 per cent less for new plant and equipment in 1950 than it did in 1949.

Since the rate of investment in new plant and equipment right now is apparently about 15 per cent below the rate for 1949, the present level of business investment may be relatively steady in 1950. That would relieve the fear, expressed by President Truman in his Economic Report, that "if the downward trend in business investment were to continue, our prospects for full recovery and continued expansion would be seriously endangered."

BUT, at the rate of investment planned by American manufacturing industry for 1950, it would take 40 years to modernize thoroughly our present industrial plant and equipment. That would still leave undone the job of increasing it to meet the needs of an expanding economy of the kind sketched by President Truman in his message.

In attaining even this rate of investment, the McGraw-Hill survey shows American business must rely overwhelmingly on its own profits, which have declined as the country has left the postwar boom behind it. Most American companies cannot sell new common stock except at ruinously low prices. Here is one case where government action is really needed to help business and help to keep a rising American standard of living.

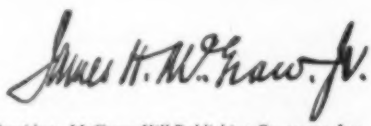
In order to get enough business investment to assure the "full recovery and continued expansion" sought by the President, our country needs:

1. Lower taxes on business income so as to release more money for new plant and equipment.

2. Liberalized depreciation allowances on old plant and tools so that business can buy new equipment faster.

3. Repeal of the present double taxation of dividends which now are taxed once as corporation income and again as personal income.

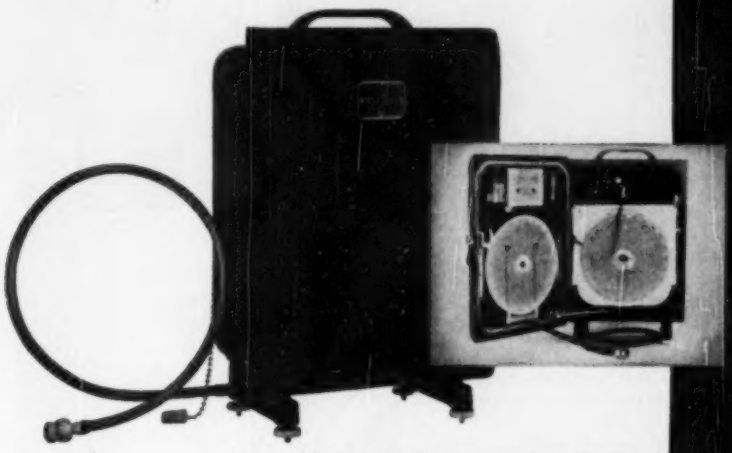
It is encouraging to have the President explicitly recognize the key importance of adequate business investment in providing steadily expanding prosperity. The next and most important thing to do is to make this recognition effective by discarding national policies which are blighting an adequate volume of business investment.



President, McGraw-Hill Publishing Company, Inc.

...Hookup for trouble-shooters

Portable pressure gauges like this are used for testing and trouble-shooting. They must be easy to connect and disconnect quickly. The connecting tubing must remain tight despite severe and repeated flexing and abuse.



Bristol Series 500 Recording Pressure Gauge fitted with American Flexible Metal Tubing, synthetic covered.

In this case, the American Flexible Metal Tubing carries the medium tested (gas, vapor or liquid), instead of serving as armor over capillary tubing. The illustrated full interlocked flexible metal tubing, synthetic covered, meets this complicated and difficult assignment with ease and assurance.

There is a style of American Flexible Metal Hose and American Seamless Flexible Metal Tubing to convey nearly every fluid or gas over widely varied conditions of temperature, pressure or mechanical stress. For full information, write to The American Brass Company, American Metal Hose Branch, Waterbury 20, Connecticut. In Canada, The Canadian Fairbanks-Morse Co., Ltd.

ANACONDA

wherever connectors must move... American

FLEXIBLE METAL HOSE AND TUBING

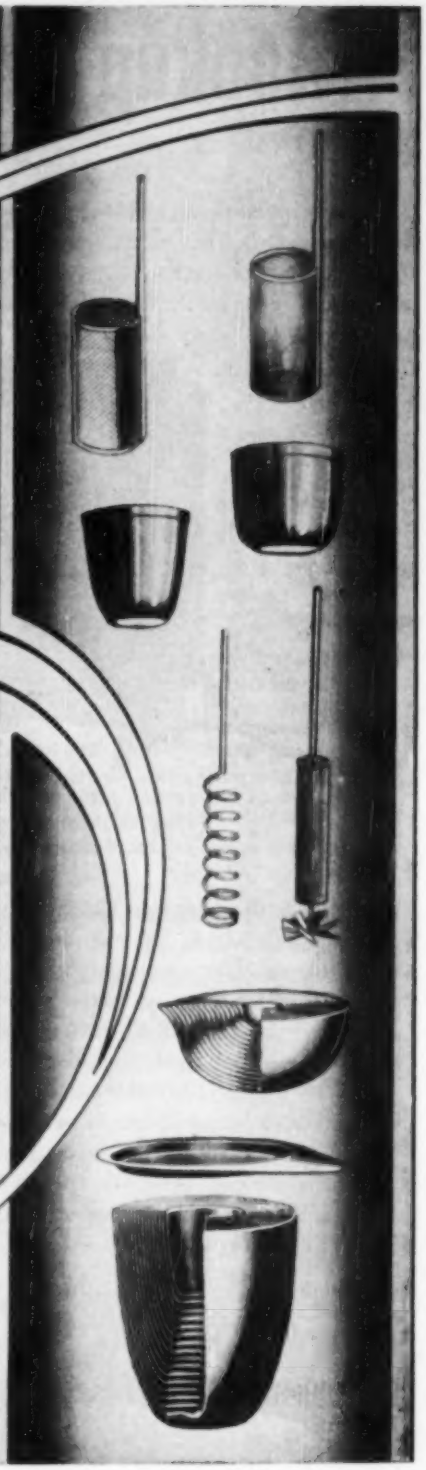
BAKER Platinum Laboratory Ware

Tested by Use

We have been manufacturing platinum laboratory ware for almost three quarters of a century and during that period have done much to bring this ware to its present exactness and high state of development. We introduced platinum-rhodium alloy laboratory ware, which is now so highly regarded, and such design changes as our reinforced rim crucibles and dishes and the Baker Low Form Crucible.

Because, naturally, our large scientific laboratories use apparatus manufactured by us in their own work, Baker Laboratory Ware is constantly subjected to continuous tests through use and so we are enabled to detect the need for improvements. An example was our observation of the tendency of stationary type electrodes to break at the junction of stem and cylinder, a fault which we overcame by reinforcing this joint.

Let us send you a copy of *Data Concerning Platinum*. It tells about our products and is a very valuable reference work too.



BAKER & CO., INC.

113 Astor St., Newark 5, N. J.

NEW YORK SAN FRANCISCO CHICAGO

What's YOUR problem?

R. L. Jenkins, lubricating specialist at Standard Oil's South Bend office solved this customer's problem because he was thoroughly familiar with job requirements and the application of his Stanorust line.

● There is a corps of such lubricating specialists throughout the Midwest, trained and experienced to help plant operators solve similar problems. Experience enables these men to find quickly the cause of lubricating troubles. Knowledge of petroleum products enables them to prescribe the lubricant needed. There is one of these lubricating specialists at the Standard Oil Company (Indiana) office near you. He is there to serve you. A call or a card will put him at your service.

Investigate the cost-saving possibilities of these lubricants.

STANOIL INDUSTRIAL OILS—for cleaner hydraulic systems, gear cases, compressors, and circulating systems.

CALUMET VISCOUS LUBRICANTS—adhere to open gears and chain drives without throw-off. Easy to apply. No heating.

STANOLITH GREASE—withstands high temperatures and resists washing by water.

THE SHOP FOREMAN of Hart Pressed Steel Corp., Elkhart, Indiana, exposes the clean metal surface beneath a coating of STANORUST 1-XC Rust Preventive by a simple wiping operation. The die shown has been protected against rust under severe outdoor conditions for over a year by STANORUST 1-XC.

How to prevent rust under severe outdoor storage . . .

RAIN, snow, heat, cold—plus coal soot from passing locomotives—could be expected to produce serious rust troubles in outside storage. The elements did, indeed, cause difficulties for the Hart Pressed Steel Corp., Elkhart, Indiana, which owns the truck and trailer dies shown above. Despite coatings of heavy oil, rusting was so severe that cleaning a die required at least three hours.

The problem was laid before a Standard Oil lubrication specialist. He pointed out that, to withstand severe outdoor exposure, a rust preventive with special qualities is needed. At his suggestion, the dies were coated with STANORUST 1-XC, a rust preventive especially developed for severe outdoor service.

Use of a STANORUST Rust Preventive has made savings for this company. Many of the dies have been exposed to the weather for over a year, yet STANORUST has kept them completely protected against rust. A die can now be cleaned and returned to service in a matter of ten minutes, as compared with the three hours previously required.

The new and improved STANORUSTS can mean big savings for you through more economical applications, better rust protection. There's a lubrication specialist near you who can help you get the most economical results. How you can obtain his services is described at left. Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANORUST
REG. U. S. PAT. OFF.
RUST PREVENTIVES

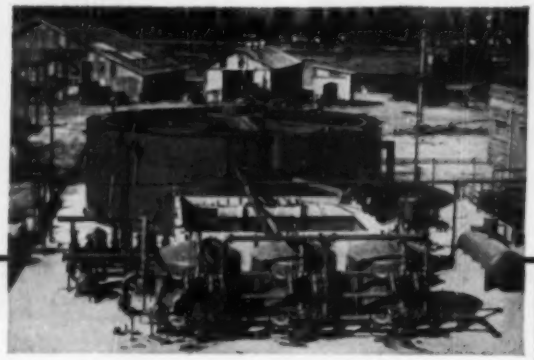
STANDARD OIL COMPANY (INDIANA) STANDARD

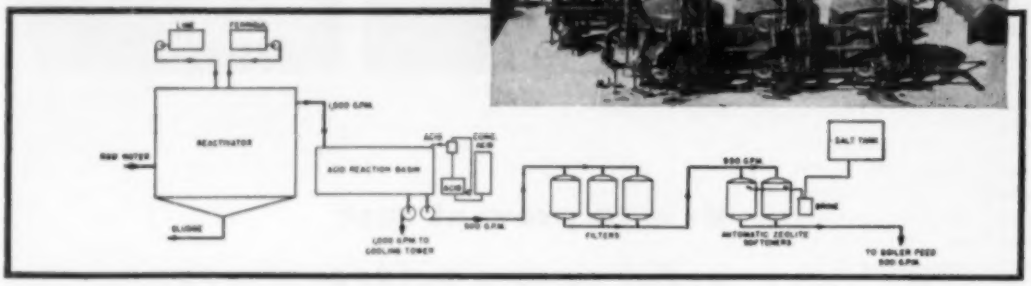
How Tide Water Oil Uses

GRAVER

FOR

COMPLETE WATER TREATMENT





At Tide Water Oil Company's Avon, California, refinery a turbid hard water supply is completely conditioned for boiler feed and cooling water services by Graver equipment consisting of Reactivator, Acid Feeding System, Anthrafilt Filters and Automatic Zeolite Softeners as shown in the flow chart above.

The raw surface water, with an inlet turbidity of 250 ppm, is first treated with lime and ferric sulfate in the Graver Reactivator. Here, partial reduction of hardness takes place while the turbidity is reduced to 3-5 ppm.

The Graver Acid Feeding System continuously and automatically proportions acid to the Reactivator effluent to reduce the alkalinity and to correct the pH to the desired value. Part of the water is thus conditioned for the cooling water system. The remainder of the water is filtered in the Graver Anthrafilt Filter and softened to zero hardness in the Graver Zeolite Softener for use as boiler feedwater.

The completeness of GRAVER service on this job is further accentuated by the facts that GRAVER:

1. **recommended to the Engineers the most effective type of equipment for their requirements.**
2. **built all the major component parts of each Water Treating Unit in its own shops.**
3. **furnished all needed accessories.**
4. **supervised the installation of the equipment.**

This *single responsibility* assures satisfactory operation of every GRAVER installation.

For best results in solving *your* water treatment problem, get the benefit of GRAVER'S 40 years of specialized experience, proven designs, and unequalled facilities. Be sure to ask for GRAVER recommendations.

GRAVER WATER CONDITIONING CO.

216 West 14th Street, New York 11, New York, U.S.A.

CHICAGO • PHILADELPHIA • CLEVELAND

GW-415

GRAVER

A DIVISION OF GRAVER TANK & MFG. CO. INC. EAST CHICAGO, IND.

30%-50% lower crushing cost

with Williams "*Super-Slugger*" Crusher

BECAUSE POWER SHOVEL LOADED STONE IS CRUSHED TO 1½ INCH OR ¾ INCH... *IN ONE OPERATION!*

Here's the extra heavy duty hammermill that spells that welcome word *economy*. Built by Williams, the pioneer of the idea of crushing limestone, shale, glass, bauxite, phosphate rock, asbestos rock, and other chemical and fibrous materials to small sizes in one operation, the new Super-Slugger represents the latest improvements and the accumulated experience of many years in building heavy-duty hammermills. Savings result not only in initial investment... cost of foundations, conveyors, drives and buildings, but in faster operation and lower power consumption. If you require high tonnage output and a machine that can "take it" your investment in the Super-Slugger will pay off in more "pay-load"... and more profit! Write for bulletin 634 for detailed information of the newest Williams Super-Slugger.

WILLIAMS ALSO MAKES...

Heavy-duty hammermills in smaller sizes; impact and roller mills for 200 to 325 mesh grinding; drier mills; air separators; vibrating screens; steel bins; complete "packaged" crushing and grinding plants.

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WILLIAMS

CRUSHERS GRINDERS SHREDDERS

News for Chemical Processors!

A STEEL-BELT CONVEYOR THAT "FLOATS" ON A COOLING "RIVER"

For Cooling Gelatin, Pitch, Grease, Synthetic Resin, Margarine, Meta-Silicate of Soda and for Heating or Cooling many other Chemicals.

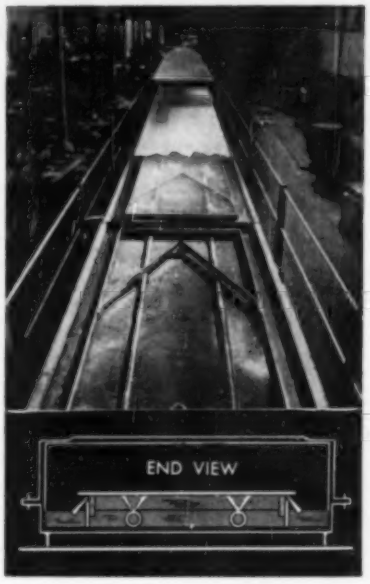
The new Sandvik Patented Water-Bed Conveyor carries your product on a solid, stainless-steel belt that is actually supported by water.

The top band of the continuous belt passes over a trough of circulating water. In operation, the water pressure is just enough to raise the belt off its supports. The surplus water overflows into gutters which collect and return the water for recirculation.

That means 100% coolant contact with the underside of the belt. Furthermore the entire conveying band runs in an air conditioned "tunnel" . . . a metal duct through which a suction fans pulls a continuous draught of clean, cool air. You get tremendous cooling capacity plus the strength, impermeability and resistance to heat, wear and corrosion inherent in the stainless steel belt.

Tapered rubber strips fitted to the edges of the flat, stainless belt hold the liquid chemical on the belt surface.

The width and length of the belt, speed of operation, temperature of the cooling or heating medium etc. all depend, of course, on the requirements of the individual application.



Sandvik can design and build a steel-belt conveyor, with or without the Patented Water-bed arrangement, to fit your specific needs. Write for further information.

SS-53

SANDVIK STEEL BELT CONVEYORS

Inquire about Sandvik's small scale water-bed unit which is available for set up in your own plant to determine cooling rates and other data.

SANDVIK STEEL, INC., *Conveyor Department*

111 Eighth Ave., New York 11, N. Y., WAtkins 9-7180

Manufacturers of Steel-Belt Conveyors for over 30 years

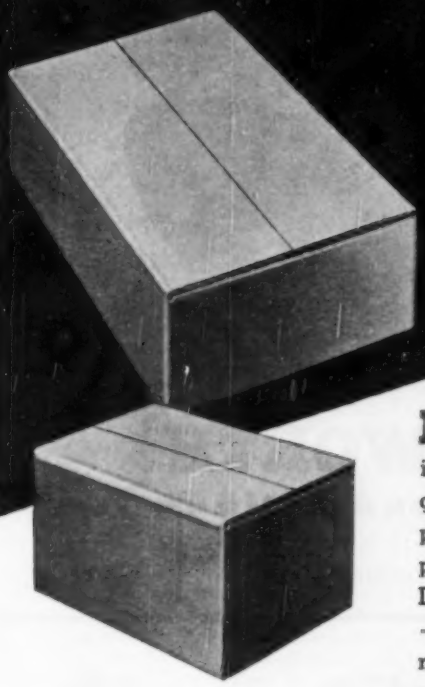
See Our Catalog in Sweets

Customer Goodwill

IS MONEY IN THE BANK

Save it BY PROTECTING YOUR PRODUCT FROM DAMAGE IN TRANSIT WITH

Gaylord Boxes



DAMAGED merchandise and its accompanying irritations often result in loss of customer goodwill. You owe it to yourself to take every precaution against this loss. You can do so by permitting Gaylord's Engineering and Research Department to analyze your present container —if it's right, they'll tell you; if it isn't, recommendations will be made. No obligation, of course—just call the Gaylord office nearest you.

GAYLORD CONTAINER CORPORATION General Offices: **ST. LOUIS**

CORRUGATED AND SOLID FIBRE BOXES ●
FOLDING CARTONS ●
KRAFT GROCERY BAGS AND SACKS ●
KRAFT PAPER AND SPECIALTIES ●

New York • Chicago • San Francisco • Atlanta • New Orleans • Jersey City • Seattle
Indianapolis • Houston • Los Angeles • Oakland • Minneapolis • Detroit • Jacksonville
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Straight-Flow Port Design reduces fluid turbulence to a practical minimum.

Seat Rings of end-seated type are screwed into the body.

Sure-Grip Malleable Hand-wheel for non-skid gripping even with heavy gloves.

Brass Liner on Glands assures greater resistance to corrosion and scoring.

WALWORTH

iron body gate valves

with screwed or flanged ends

...8 Outstanding Features

For complete information on these new Walworth Iron Body Valves, see your local Walworth distributor, or write for bulletin 106.

WALWORTH

valves and fittings

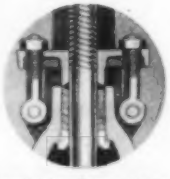
60 EAST 42nd STREET **NEW YORK 17, N. Y.**

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

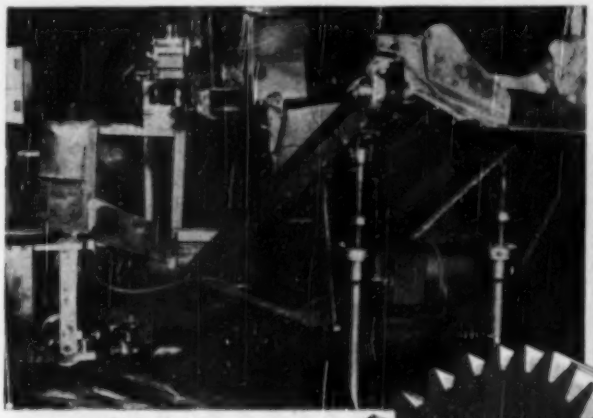
T-head Disc-to-Stem connection on OS&Y types provides stronger connection, prevents loosening of disc by corrosion.

Bronze Back-Seat Bushings in bonnets of OS&Y valves.

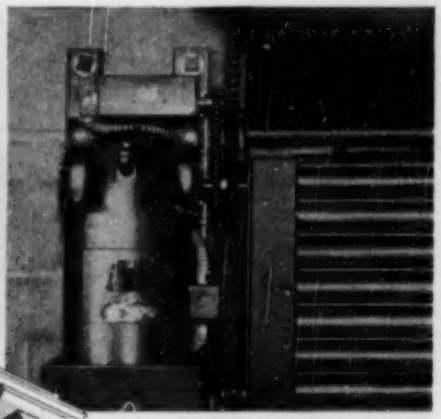
Solid Web Type Disc in OS&Y valves for greater strength and longer service.



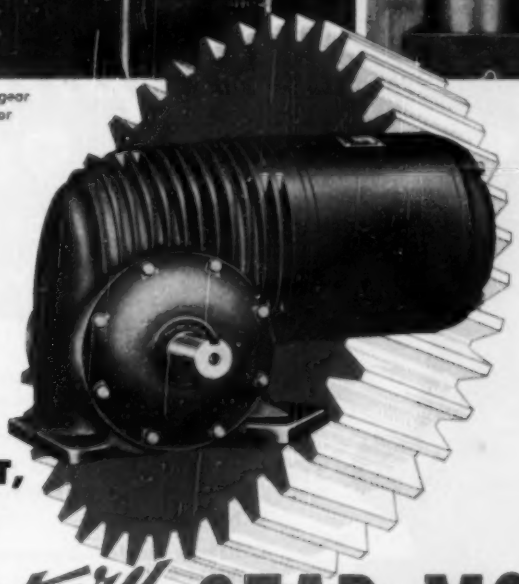
Hinged Gland Eye-Bolts on OS&Y valves permit faster, easier repacking under full pressure.



Century ¼ horsepower gear motor driving a conveyor



Century ½ horsepower gear motor operating a door opener



Specify COMPACT, RUGGED

Century GEAR MOTORS

for Your High Torque Slow Speed Requirements

Century's line of gear motors has gained an enviable reputation, created by their successful performance on thousands of industrial machines. They are built to supply the right power at the right speed.

Century Gear Motors are engineered to maintain the high torque slow speed shaft in rigid alignment. The gear housing and mounting feet are cast in one piece to provide extra strength and rigidity. In addition, the slow speed shaft is located near the base for greater strength and rigidity.

The motor is equipped with ball bearings and the shaft with tapered roller bearing.

Century Gear Motors are available in sizes from ¼ to 1½ horsepower — single phase, polyphase and direct current.

Specify Century Gear Motors for all your slow speed power requirements.

CENTURY ELECTRIC COMPANY

1806 Pine St., St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

CE-444

Free Yourself

from Constant Repair and Replacement Troubles with the

Chapman

LIST 960

...the long lasting Gate Valve!

Unlike ordinary valves, the Chapman 960 is extra-sturdy to give you longer trouble-free service. And here's why —

1. Body and yoke are made of tougher forged steel.
2. A flanged, forged-steel packing gland protects threads on valve yoke from rust and corrosion.
3. No gaskets to blow.
4. Repack it under full pressure — no pressure transmitted to valve stem.
5. Newly designed stem and wedge gate connection gives 50% increase in strength at points where extreme stress can develop.
6. Malcomized stainless steel seat rings and wedge faces ensure maximum wear resistance.

So for your best buy specify the Chapman List 960. Available in sizes from ¼" to 2" — carbon steel for pressure range 2000 pounds at 100° F., 380 pounds at 1000° F. For higher pressures, specify List 990.

The Chapman Valve Manufacturing Company
INDIAN ORCHARD, MASSACHUSETTS

let's get down to earth!

Many users of stainless steel speak so glowingly of it that it would seem that there is nothing stainless *can't* do. Stainless steel is more than *one* kind of specialty steel... it is a complete series of steels for many uses.

Unless the *right* stainless analysis is selected, it won't do a good job. Crucible, a pioneer in the development of stainless steels, offers you the services of an unsurpassed staff of metallurgists to help you work out your stainless application problem.

These engineers and metallurgists are freely available to you. One word from you puts a background of 50 years of specialty steel leadership at your service. CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, New York 17, N. Y.

Among many stainless applications that are finding wide acceptance in the processing field are beaters, blenders, tanks, tubing, vats, evaporators, etc. Crucible's experience in this field can help you put stainless to work in your equipment more effectively.

CRUCIBLE first name in special purpose steels

hot and cold rolled **STAINLESS SHEET AND STRIP**

STAINLESS • HIGH SPEED • TOOL • ALLOY • MACHINERY • SPECIAL PURPOSE • STEELS

It's the Nash!

Nash Compressors in your plant can automatically increase the capacity of your absorption equipment, for with the Nash it is possible to secure absorption directly in the pump.

This is due to the Nash liquid compressant operating principle, involving a fluid vortex through which the gas must pass in the process of compression. To absorb from a gas, simply flow absorbent through the compressor as the compressing medium. In this close contact of liquid and gas, the desired fractions are picked up and retained by the absorbent. This in no way impairs efficiency as a compressor.

This useful stunt is made possible by the fact that slugs of liquid entering a Nash Compressor do no harm to the pump structure. Nash pumps have only one internal moving part, simple, non-wearing, and employ no gas contaminating internal lubrication. There are no valves, gears, pistons, or sliding vanes, and original pump efficiency is maintained over a long life. In a single stage Nash Compressors produce 75 lbs. pressure or vacuums to 26 in. of mercury, with capacities up to 6 million cubic feet per day in a single structure. Investigate these pumps now.

One moving part.

No internal wearing parts.

No valves, pistons, or sliding vanes.

No internal lubrication.

Low maintenance.

Slugs of liquid entering pump do no harm.

Original performance constant over a long pump life.

Non-pulsating pressure.

Saves floor space.

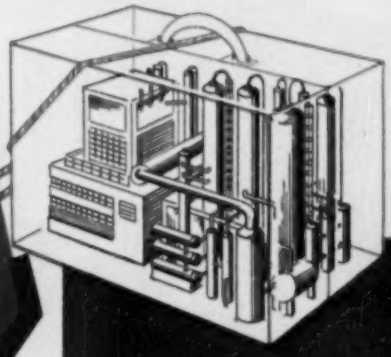
75 pounds in a single stage.

NASH ENGINEERING COMPANY

304 WILSON, SO. NORWALK, CONN.

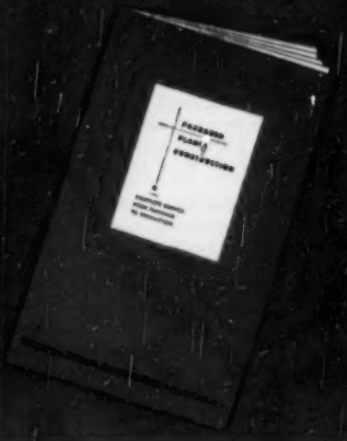
Wigton-Abbott Corporation

builds COMPLETE PLANTS*



Yours for the Asking

Reading time, only 10 minutes —but it will save time and money by answering basic questions regarding this new concept in plant construction.



Whether the problem involves construction of facilities designed from pilot plant data, the development of new processes from flow sheets, or the expansion of present plant facilities, Wigton-Abbott Corporation "Packaged Plant Construction" offers the most economical and efficient solution in the shortest time.

A representative will be glad to consult with you on any phase of plant design and construction.

Wigton-Abbott Corporation

DESIGNERS...ENGINEERS...CONTRACTORS...PLAINFIELD, NEW JERSEY

10 Years, 24 Hours a Day, Grinding Clinker and Slag

TEN YEARS AGO this three compartment *Compeb* mill was installed in the Pennsylvania plant of a large cement manufacturer for finish grinding cement.

The mill has been in continuous operation ever since, grinding cement clinker and blast furnace slag to a product of 2400 specific surface. The most recent inspection indicated that this mill would be good for many more years of service.

The plant's operators are pleased — report a well-graded, uniform product is obtained with very low maintenance.

4 REASONS WHY CEMENT MEN INVEST IN A-C MILLS

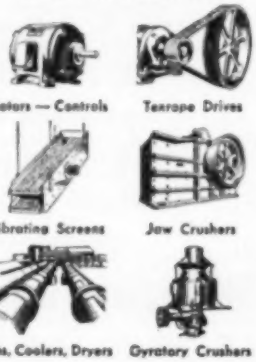
- **Wide selection — Allis-Chalmers builds *five separate types* of grinding mills in a maximum range of sizes. That means you'll get the *right* type and size mill for your specific job... Better efficiency and economy!**
- **"Stress-relieved" — All-welded mill shells are put through an annealing process that eliminates strains . . . makes a better mill.**
- **Long bearing life — Extra large bearings mean low bearing pressure.**
- ***Unsurpassed experience*—and manufacturing facilities! Allis-Chalmers has built over 4,000 grinding mills.**

Call on A-C's wide experience next time you have a grinding problem. There is an Allis-Chalmers office in your area. A-2913

ALLIS-CHALMERS, 1147A SO. 70 ST
MILWAUKEE, WIS.

Compeb and *Texrope* are Allis-Chalmers trademarks.

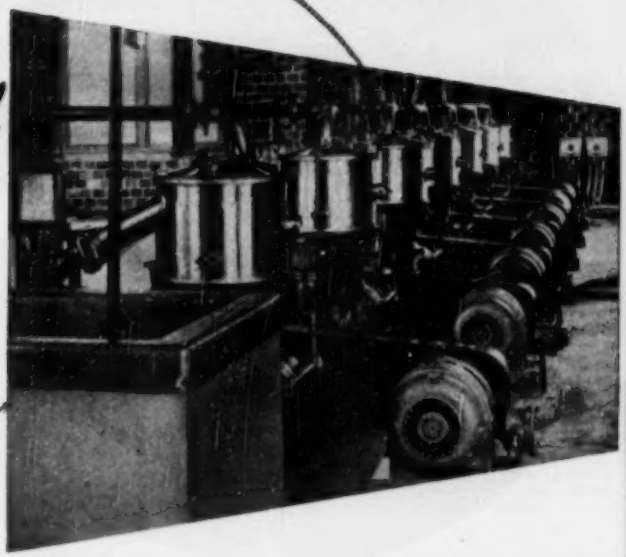
IT PAYS TO SPECIFY MOTORS... CONTROLS... V-BELT DRIVES — ALL FROM ALLIS-CHALMERS



ALLIS-CHALMERS

Sales Offices in Principal Cities in the U.S.A. Distributors Located Throughout the World.

Another INTERESTING JOB FOR *Centrifugal* FORCE



Converting a Waste Product INTO ETHYL ALCOHOL!

● *See what centrifugal force can do for you.*

There was a time when the sulphite used in converting wood pulp into paper was discharged to waste. The wood sugar in the pulp liquor was not utilized. Now this sulphite liquor, once regarded as useless, yields ethanol, methanol and fusel oil.

Part of the success for this waste-product utilization belongs to centrifugal force, which in the fermentation stage separates the yeast from the beer. Without the continuous separation afforded by centrifugal force, it would be impossible to obtain an adequate production rate.

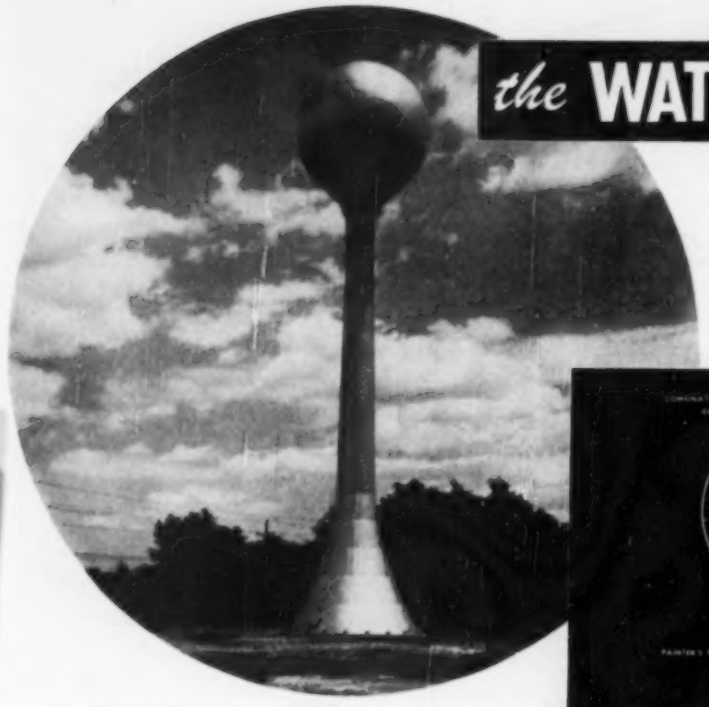
Your process may be remote from sulphite recovery, yet capable of the same continuous separation — of the same speed-up of production. It will pay you to investigate for yourself.

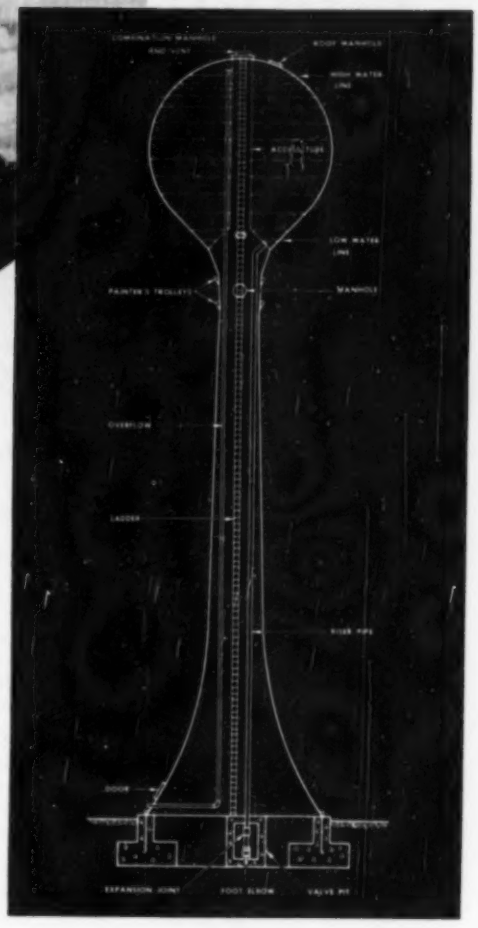
THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL *Processing Systems*

the WATERSPHERE

- Attractive Appearance
- Modern Design
- Simple Construction





The Watersphere impresses you with its striking appearance—but it offers more than architectural beauty. It is used to provide dependable gravity pressure in municipal water systems. At industrial plants, the Watersphere furnishes a gravity water supply for general service or fire protection.

The simple construction of the Watersphere, as shown in the accompanying diagram, makes it easy to maintain. Smooth, butt-welded joints eliminate corners or edges that invite corrosion. An inside ladder simplifies the job of climbing the tank for inspection and painting.

The Watersphere is available in the capacities listed below. Special designs will be furnished for sizes over 150,000 gals.

WATERSPHERE SIZES . . .

Capacity in Gallons	Diameter of Sphere	Diameter of Base in Feet and Inches			
		50 Feet to bottom	75 Feet to bottom	100 Feet to bottom	125 Feet to bottom
25,000	19′-4″	14′-0″	16′-6″	20′-0″	23′-0″
30,000	20′-4″	14′-6″	17′-0″	20′-6″	23′-6″
40,000	22′-4″	15′-0″	17′-6″	21′-6″	24′-6″
50,000	24′-0″	15′-6″	18′-0″	22′-0″	25′-0″
60,000	25′-6″	16′-0″	18′-6″	22′-6″	25′-10″
75,000	27′-4″	17′-0″	19′-6″	23′-6″	27′-0″
100,000	30′-0″	18′-0″	21′-6″	25′-0″	30′-0″
150,000	34′-0″		24′-0″	26′-0″	28′-0″

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STRUTHERS WELLS Equipment

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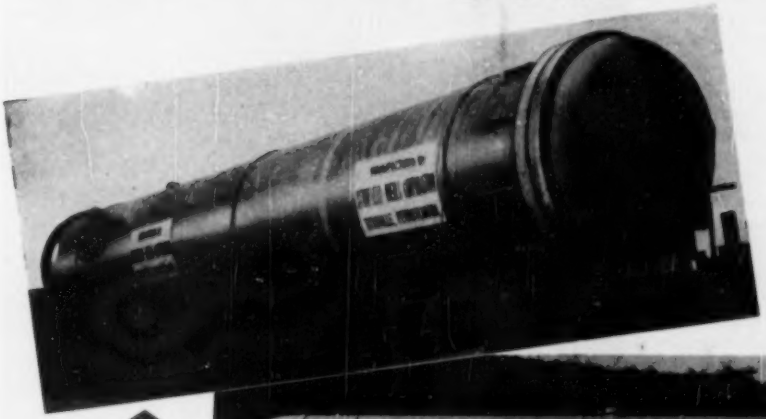

Propane Storage Tank 1375 Barrels capacity. 12 ft. dia. x 60 ft. straight shell. Tanks have fabricated hemispherical heads using a dished plate center and pie shaped dished sections welded together to form the large spherical head, designed and built under requirements of API-ASME Code for 225# working pressure.

Stainless steel clad vessel using 18-8 stainless clad plate built under the requirements of the ASME Code, Para. U-69 for 180 PSI. 7' 1" I.D. x 41'-6" high with bolted head.

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Turn to Struthers Wells for advanced engineering and research counsel when your requirements call for difficult "out-of-the-ordinary" equipment —when there is a question of the proper fabrication method or the most suitable materials. Successfully solving these problems of industry for more than 50 years, Struthers Wells offers a vast storehouse of engineering and research skill, knowledge, craftsmanship and experience with the rapid developments in standard or corrosion-resistant metals, which makes for perfection in design and manufacturing. Use Struthers Wells facilities for equipment of any type or for any specialized processing service.

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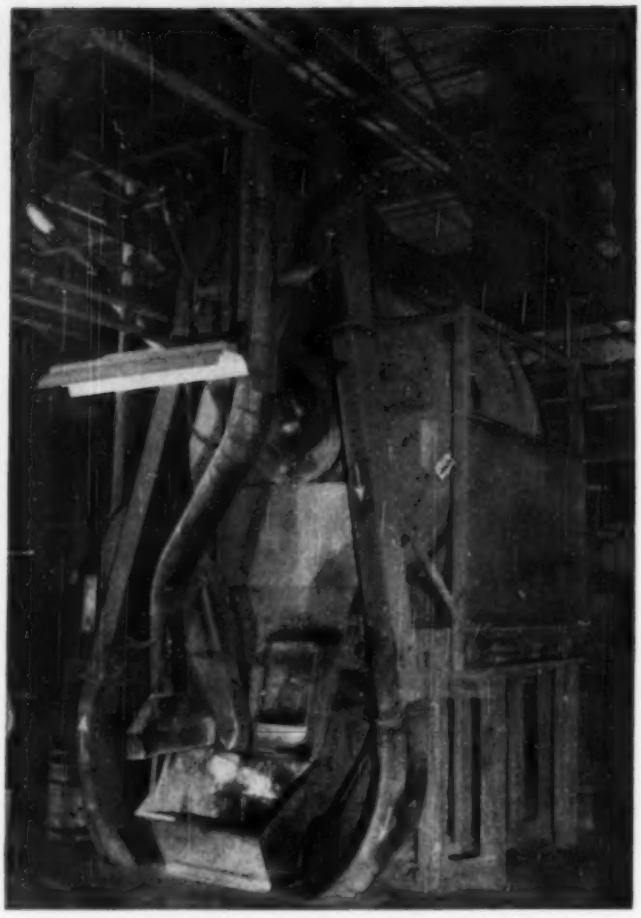

Efficient, low cost delivery of fluffed asbestos fibre and dry resins to mixers was achieved by this S-A designed REDLER elevator. But, just as important was the fact that these REDLERS were fitted compactly into the existing plant layout of machinery in this brake block and lining plant.

Industries of every description find that S-A recommendations, based on a complete line of all equipment types, provide efficient, low-cost bulk materials handling systems. And, the closed circuit feature of REDLERS meets a wide variety of specialized needs such as recirculation, preventing spillage and delivery free from outside contamination.

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RAYBESTOS-MANHATTAN INC.
MANHATTAN RUBBER DIVISION
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Floor level receiving hopper feeds fluffed asbestos fibre and dry resins to closed-circuit REDLER loop-boot type elevator. Dust-tight REDLERS for this application are powered with 2 HP motor drives. REDLERS feed directly to feed opening of rotary mixers. This application replaced old skip-hoist bucket loaders that created dust hazard. System handles 8 TPH at speed of 60 FPM.

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On Steel Plate Construction

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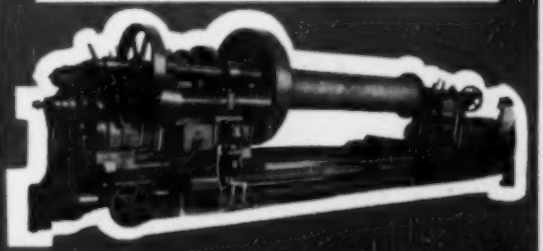
16' length x 94" diameter lathe gives Posey Iron Works an edge on big jobs requiring lathework. This equipment stands in the South Plant's special erection shop.



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ESCO welcomes consultation with chemical plants on problems of corrosion, heat and abrasion. See the *ESCO* office nearest you or write us direct. Our catalog of stainless and high alloy steels in process equipment is available upon request. Use the coupon.

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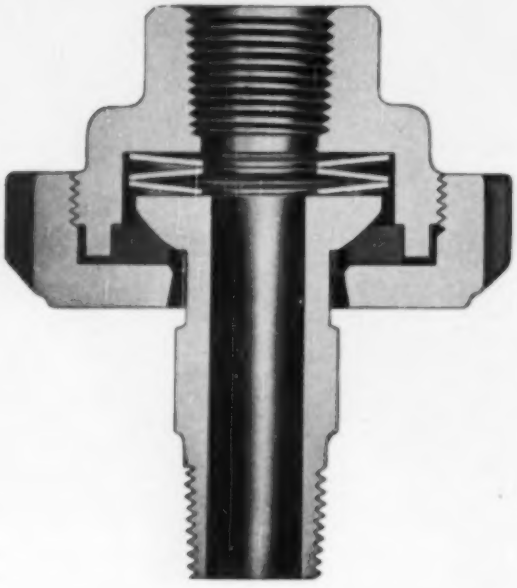
Improved Barco Rotary Swivel Joints
FOR MINIMUM FRICTION



FRICTION-FREE PERFORMANCE WITH LOWER TURNING TORQUE. This compact, lightweight, low cost joint is especially efficient at high and low temperatures and pressures. It handles alternating steam and cold water without leakage. It is much more compact for the same capacity and has performed successfully on continuous rotation applications up to 30 RPM. This new, low torque joint will greatly reduce power costs and worker fatigue. It is practically maintenance free.

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Install these remarkable joints now. Our engineers will gladly discuss your problems. Sizes ⅜", ½", ¾", 1". When ordering, give complete information about pressures, temperatures, fluids or gases, and any other special conditions.

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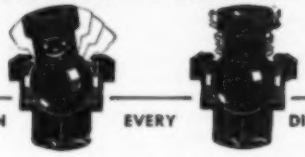

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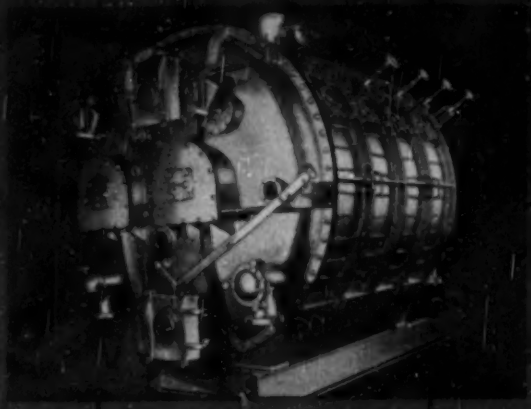

...through new and unique features.....

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DRUM DRYING BUILDS PROFITS!

1. Vacuum drying with BUFLOVAK Vacuum Double Drum Dryers is a low temperature, continuous method of producing dry materials at low operating cost.

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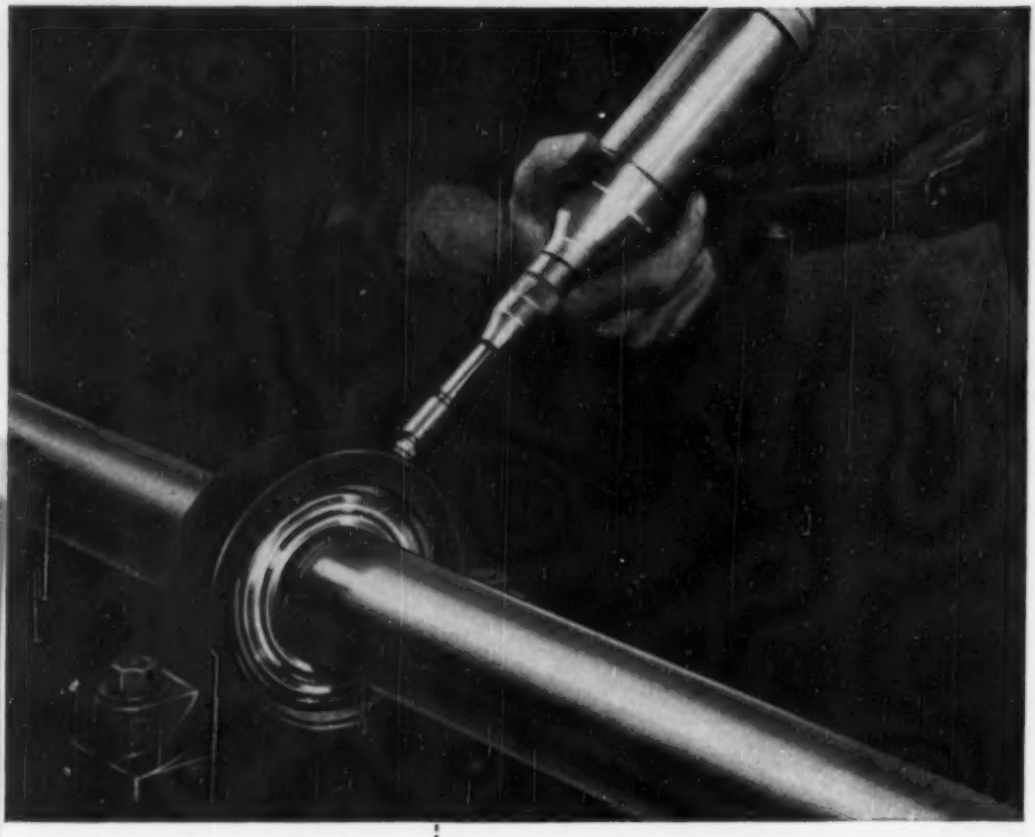

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METALLIC-BACKED neoprene seals are used in this famous bearing—and they are engineered to *stay put.* They can't blow.

Your lubricant stays in; dust and dirt stay out; the result is years and years of trouble-free performance.

The "SC" Bearing is a new member of the Dodge 30,000 hour line. Modern styling. Rugged one-piece cast iron housing. Long inner race. Radial and thrust load capacity. Fully self aligning. *WRITE* for special "SC" bulletin, giving complete specifications.

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Precision built bearing for small shafts and moderate loads. Pillow blocks, flange bearings and hanger bearings available from distributors' stocks in shaft sizes ranging from 3/4" to 2-7/16".

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained, he can give you valuable assistance on new, cost saving methods. Look for his name under "Power Transmission Equipment" in your classified telephone book.

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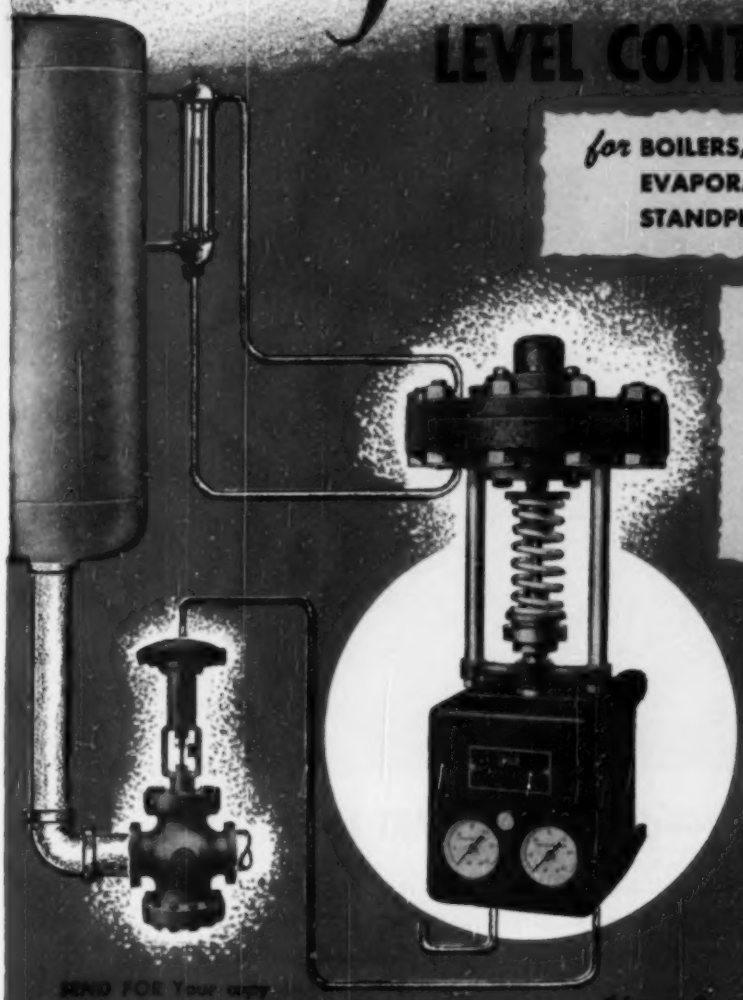

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PRESSURE REDUCING VALVES • PUMP GOVERNORS • PRESSURE CONTROLLERS
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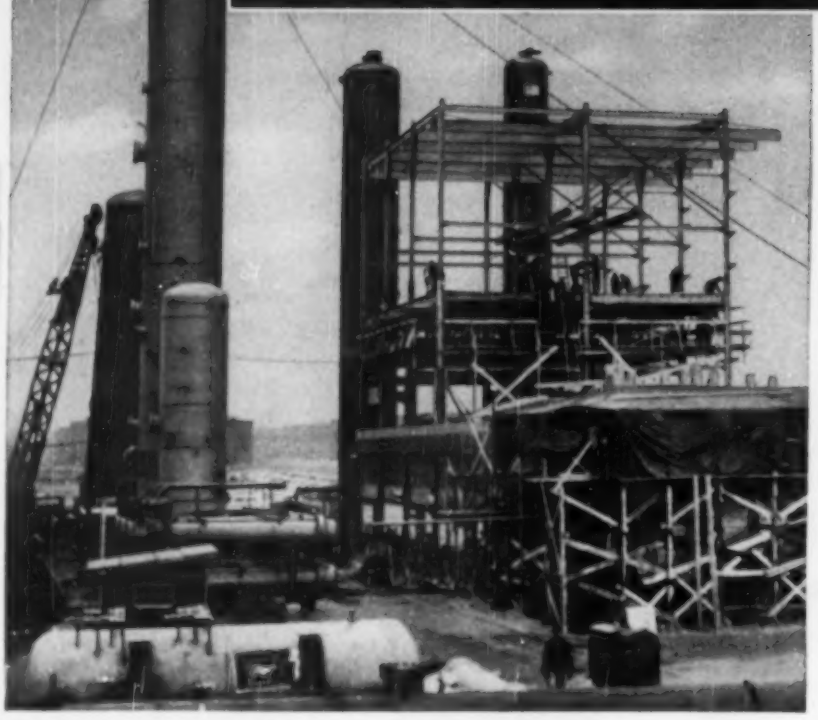
Construction by GRAVER



View at left shows Graver construction job including towers fabricated and erected by Graver.

Complete Service... FROM START TO FINISH

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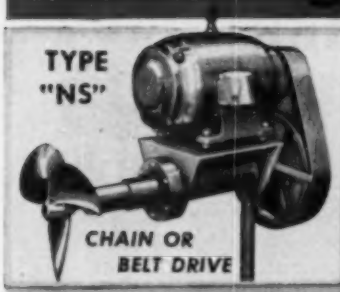
CHICAGO ENGINEERING DEPT.: 880 BERGEN AVENUE, JERSEY CITY, NEW JERSEY HOUSTON

A DIVISION OF GRAVER TANK & MFG. CO. INC. EAST CHICAGO, IND.

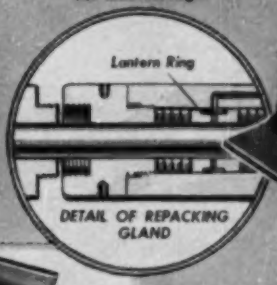
INTERNATIONAL
Side Entrance Mixers

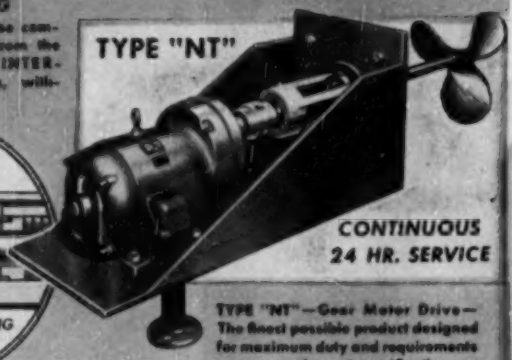


INTERNATIONAL presents a complete line of Side Entering Liquid Mixers—in various types from Continuous Heavy Duty 24 Hour Service Models to types for less exacting requirements at lower price. Every unit a proven product of the finest design and workmanship—carefully assembled and tested under the most exacting conditions—shipped ready to use, and Guaranteed.

REPACKING
Stuffing Box may be completely repacked from the outside, in all INTERNATIONAL Mixers, without tank leakage.

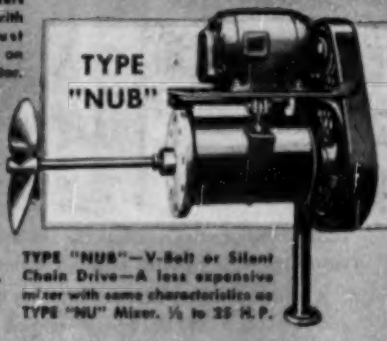
TYPE "NS"—Heavy Duty V-Belt or Silent Chain Drive—A shaft coupled design. Mixer Speed can be readily changed. All welded steel construction. 3-Bearing Support Mixer Shaft. (Double Lantern, two Bearing Stuffing Box and combination radial and thrust rear bearing). ½ to 25 H. P.





TYPE "NT"—Gear Motor Drive—The finest possible product designed for maximum duty and requirements—same equipment specifications as TYPE "NS." ½ to 25 H. P.

All INTERNATIONAL Mixers shown here are fitted with Heavy Duty Ball Thrust Bearings. No thrust on Gears or Motor.



TYPE "NU"—All Steel GEAR MOTOR DRIVE. A less expensive all-welded Mixer. No cast parts. 3-Bearing support to mixer shaft (two Ball Bearings and single lantern bearing on shaft). Suitable for most installations where double lantern bearings are not required. ½ to 25 H. P.

TYPE "NUB"—V-Belt or Silent Chain Drive—A less expensive mixer with same characteristics as TYPE "NU" Mixer. ½ to 25 H.P.

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RIBBON MIXERS

PORTABLE MIXERS

BALL MILLS

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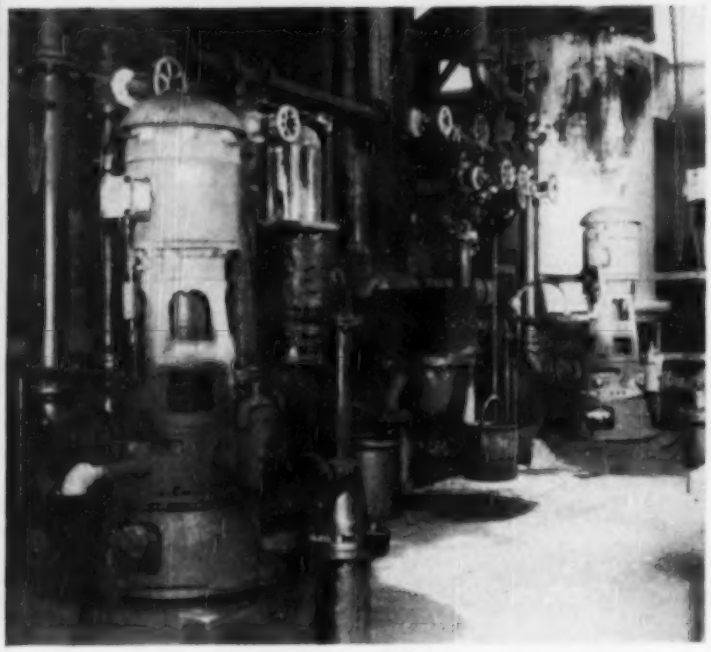
Check Your Pump Purchases by These Dimensions

1. **Materials**
2. **Efficiency**
3. **Performance**
4. **Dependability**



LaBour Type G (packingless self-priming centrifugal) pumps in a contact acid system.

In the field of chemicals, there are four dimensions by which pump values are determined.

A wide choice of MATERIALS is necessary, and as much EFFICIENCY as you can get. PERFORMANCE, the ability to meet the specified requirements, is the third measure.

But don't stop there in choosing your chemical pumps. The fourth dimension of value can be most important of all: DEPENDABILITY —freedom from service interruptions.

For more than 27 years, LaBour pumps have measured up by all four dimensions. That's why so many experienced operators are unwilling to take anything less for their important pumping jobs.

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LABOUR

THE LABOUR COMPANY, INC. • Elkhart, Indiana, U.S.A.

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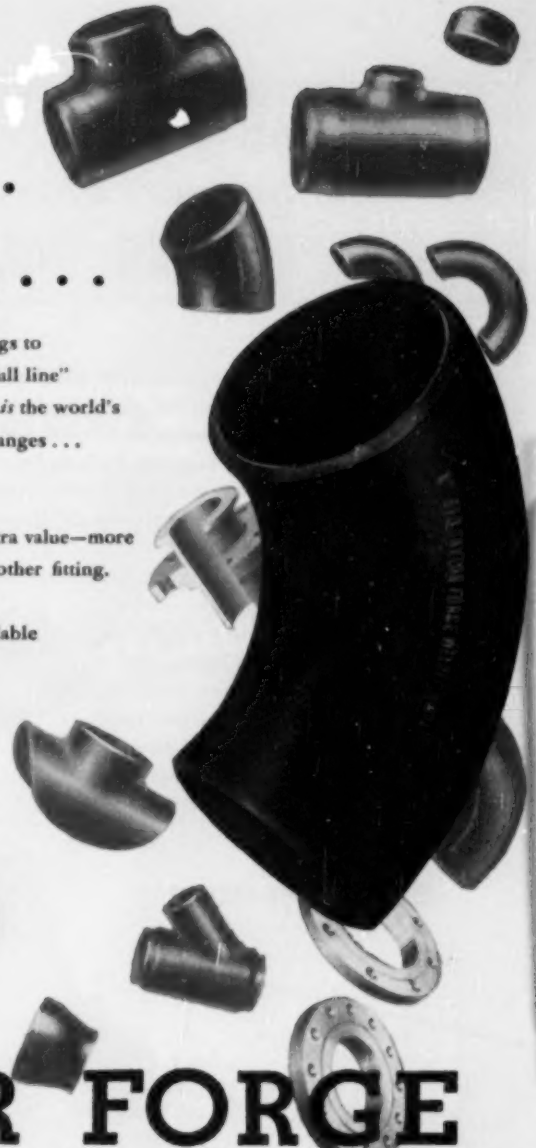
FULL SERVICE . . . .



We have repeatedly urged users of welding fittings to accept no less than the *full line.* When we say "full line" we don't just mean its *completeness* . . . though it *is* the world's most complete line of forged steel fittings and flanges . . . and it *does* contain the widest range of types, sizes, weights and materials.

When we say "full line" we mean full value—extra value—more and better features than can be found in any other fitting. The technical brains and forging skills which conceived these extra values continue to be available to you through the Taylor Forge organization, and through the Taylor Forge distributor who is your industrial neighbor.

Since Taylor Forge welding fittings "have everything," why compromise on less than the best?

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This may be producing valves the "hard way", but for Lunkenheimer, it's the only way since it safeguards our proudest possession . . . the mark of unswerving quality and dependability.

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Fig. 2150

150 lb. S.P. Bronze Gate

Like three valves in one. Number 2150 Double Disc, or Number 2151 Solid Wedge Disc, Rising Stem; or Number 2153 Single Wedge Disc, Non-rising Stem. How to convert one type to another by a simple interchange of trimmings is fully explained in Circular Number 574 available from your Lunkenheimer Distributor or direct.

Continually improved testing equipment, together with superior metallurgy and the most modern production equipment assures longer and trouble-free operation, making Lunkenheimer Valves cost less per year of service.

Another assurance of better valve service

In the event of valve trouble, you need and can depend upon, quick service from your Lunkenheimer Distributor. His stocks and facilities shorten production tie-ups, save you dollars and hours. Whether it's an emergency, routine maintenance or new installations, phone your Lunkenheimer Distributor for fast, dependable service.

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IS YOUR BEST BUY
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conditions
B&W
makes ANY TYPE you need -- SEAMLESS & WELDED
ALL THESE . . . AND MORE
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Croloy 18-8 Si (Type 302B Mod.)
Croloy 18-8 FM (Type 303 Mod.)
Croloy 18-8 S (Type 304)
Croloy 20-10 (Type 308)
Croloy 25-12 (Type 309S)
Croloy 25-12 Cb (Type 309S Cb)
Croloy 25-20 (Type 310)
Croloy 16-13-3 (Type 316)
Croloy 16-13-3 Cb (Type 316 Cb)
Croloy 18-13-3 (Type 317)
Croloy 18-8 Ti (Type 321)
Croloy 12 Al (Type 405)
Croloy 12 (Type 410)
Croloy 12-2 (Type 414)
Croloy 13 (Type 420)
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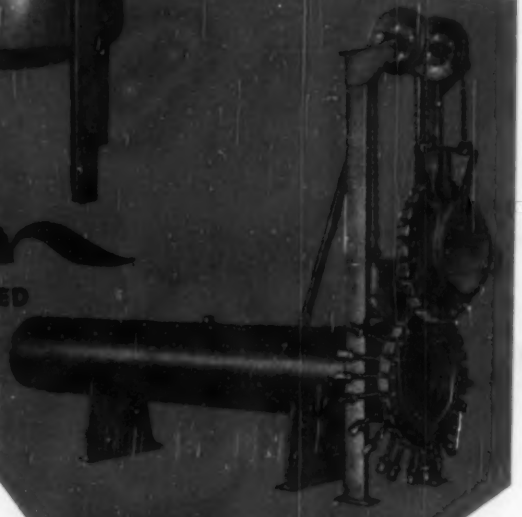

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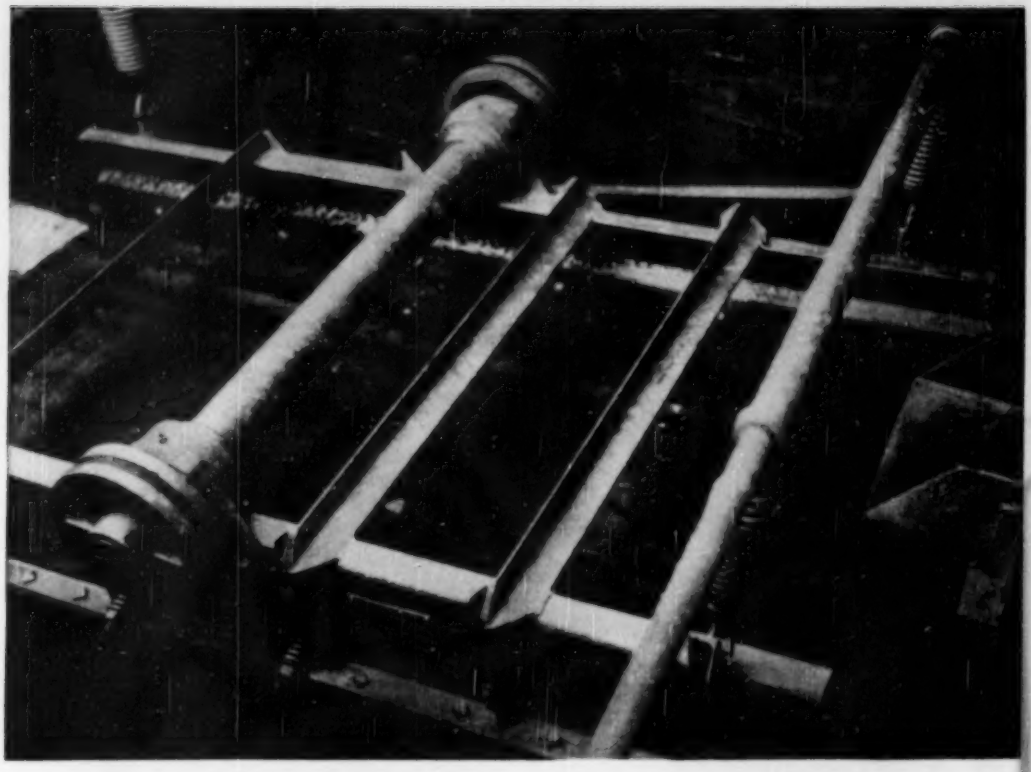

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1. Save liquids from solids
2. Save solids from liquids
3. Remove fines from coarser materials

Furthermore, Robins Hydrex Screens assure you of continuous operation. That's because the high-speed vibrations of these screens produce a self-cleaning, self-discharging action.

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The ABC's of Powell Valve PERFORMANCE

Powell Flush Bottom Tank Valve. Made in two designs: **Fig. 2309,** in which disc rises into tank to open valve; **Fig. 2310,** in which disc lowers into body of valve.

Fig. 2433-M—150-pound Monel Metal® Swing Check Valve with flanged ends and bolted flanged cap. Disc has ample lift to permit full, straightway, unobstructed flow through the valve body.

Fig. 3051—Stainless Steel "Y" Valve with flanged ends, bolted flanged yoke-bonnet and outside screw rising stem.

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Ask your nearest Distributor—or write direct

Fig. 1096-HA—300-pound Hastelloy† Separable Body, Reversible Seat "Y" Valve. Lower half of body can be unbolted and turned through arc of 180° to make a 90° Angle Valve.

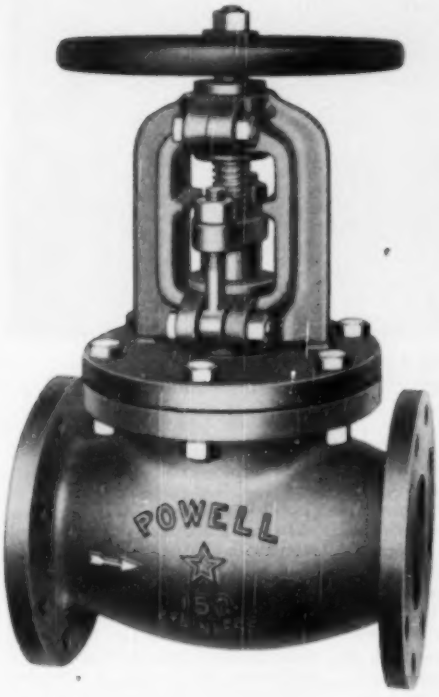

Fig. 1847—200-pound Stainless Steel Swing Check Valve with screwed-in cap and regrindable, renewable disc.

Fig. 2429—150-pound Stainless Steel Globe Valve with flanged ends, bolted flanged yoke and outside screw stem.

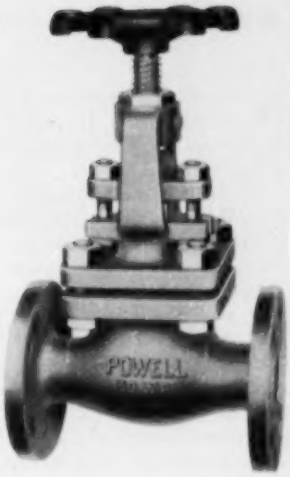

Fig. 1969-NI—150-pound Nickel Gate Valve with flanged ends, bolted flanged yoke-bonnet and outside screw stem. 4-bolted flanged bonnet Angle and Globe Valves in this design are also available.

*Registered trade-name of the International Nickel Co., Inc.

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He brought the problem to the Basic Industries Laboratory, seeking an improvement in the sifting method. Tests were run that showed the grinding circuit to be at fault.

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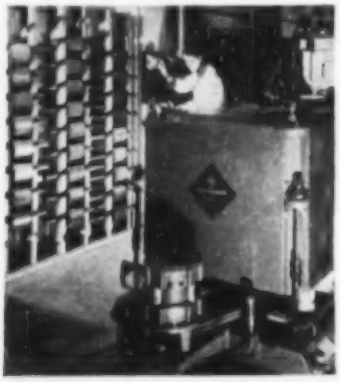

COMMERCIAL SIZE gyratory sifter handles sifting tests. Laboratory also contains full-size roller mill in pilot plant circuit. Corrugated and smooth rolls along wall are for batch roller mill tests.

THE ALLIS-CHALMERS Basic Industries Research Laboratory is primarily a service organization. It is manned by technically trained personnel and equipped with the necessary apparatus for investigating process problems that develop in the beneficiation of raw materials.

Will Mitchell, Jr. Director, Basic Industries Laboratory

Laboratory services include research on the development of new or existing industrial processes . . . research on new machinery, or improvement of old machinery . . . fundamental research into basic principles underlying modern mechanical, process or plant design.

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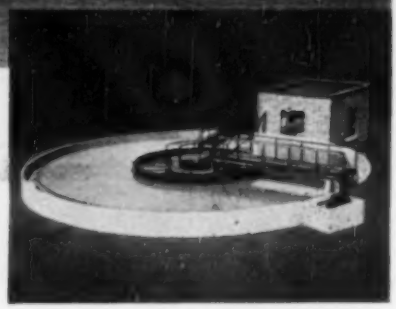

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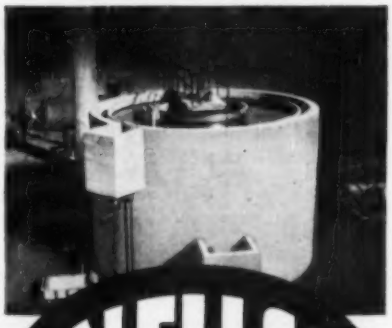

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"Crack and crevice-free interior leaves no place for foreign matter to lodge."
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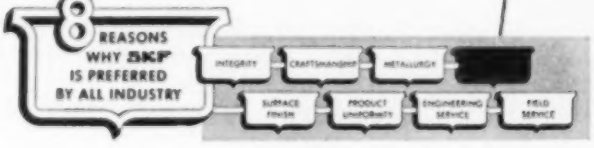

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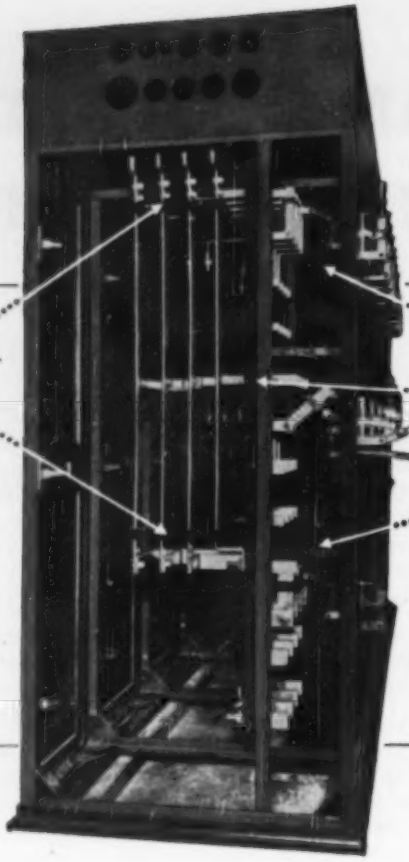

In addition to bus supports and mounting panels of K&M Ebonized Asbestos, this Pringle Switchboard has separators of K&M Monobestos—another versatile K&M material that betters electrical equipment.

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Pringle Electrical Manufacturing Company, Philadelphia, applies K&M Ebonized Asbestos to bus supports and mounting panels of the Dead Front Safety Knife Switch illustrated. The electrical safety factor is inherently high per unit of material. So is the mechanical safety factor, because there is strength in all directions with K&M Ebonized Asbestos. It particularly resists shock, vibration and temperature fluctuation.

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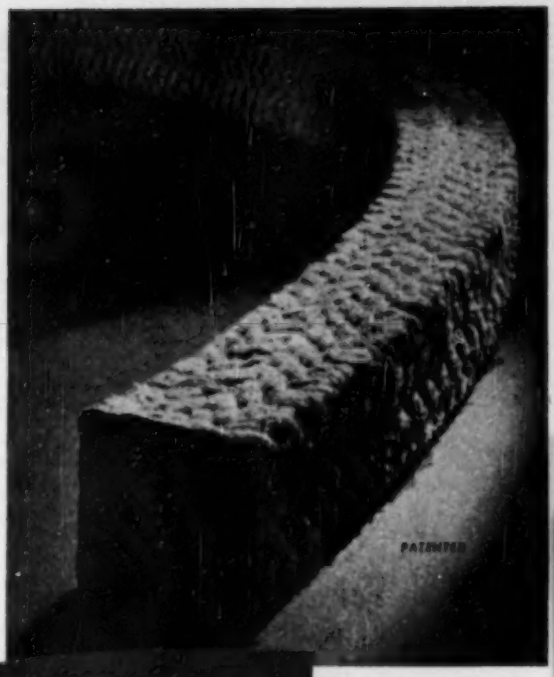
QUESTION:

Which Garlock rod packing is braided through and through for longer life?



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LATTICE-BRAID

The unique structural design of LATTICE-BRAID packing gives it great strength, long life and unusual flexibility.

Supplied in several styles, including:

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- GARLOCK 731 (asbestos)—for steam, gases or water at temperatures up to 700° F.
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- GARLOCK 733 (asbestos)—for hot or cold water or alcohol at medium or low pressures.
- GARLOCK 734 (asbestos)—for cold gasoline, kerosene and light oils.
- GARLOCK 736 (blue asbestos)—for concentrated mineral acids.
- GARLOCK 740 (flax)—for cold water at medium or low pressures.
- GARLOCK 745 (flax)—for heavy hydraulic service against cold water.
- GARLOCK 751 (cotton)—for hot or cold water.

In GARLOCK LATTICE-BRAID *every braiding strand* passes diagonally *through* the body of the packing at an angle of approximately 45°. All the strands are strongly lattice-linked together into a structural unit which holds together even when the packing is worn far beyond the limits of wear of ordinary braided packings.

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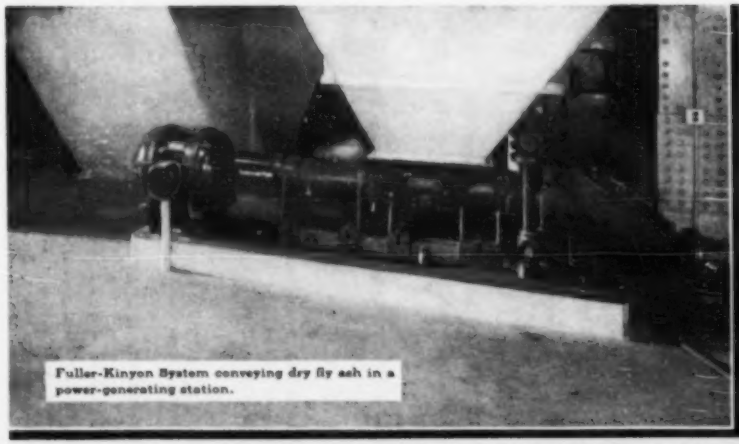

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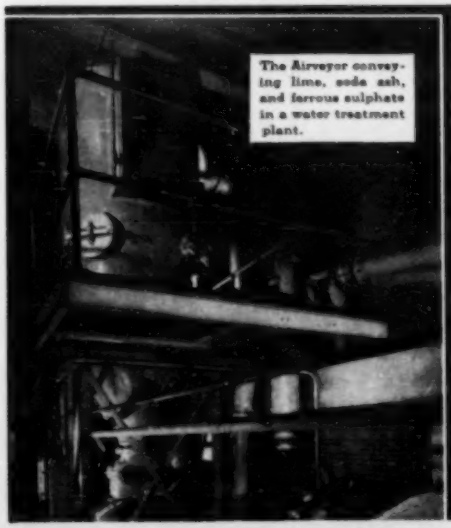
Airslide conveying hot dust from a Cottrell precipitator.

CONVEYING at its BEST!



The Airveyor conveying lime, soda ash, and ferrous sulphate in a water treatment plant.

THE engineering and research facilities of the Fuller Company assure you the best design possible, and, in addition, equipment built to give lasting satisfaction . . . assets accrued through the many years of experience and intimate contact with the field of pneumatic conveying of dry pulverized, crushed, and granular materials. Added to these facilities, service engineers of long and varied experience, is further assurance that Fuller equipment will give you the best of operating results.

These facts are conclusively borne out by the many Fuller installations made during the past 25 years in the chemical-process, as well as other industries.

FULLER-KINYON CONVEYING SYSTEMS: For conveying dry pulverized materials, with air, through pipe lines. Commonly used for conveying from pulverizer mills, pneumatic or mechanical collectors, bins and silos. Also for loading and unloading cars, ships and barges. Built in stationary and portable types. Capacities from a few tons an hour to 300 tons an hour. Distances to 3600 feet; elevations to 300 feet.

F-H AIRSLIDE CONVEYOR: For conveying fine, dry materials, without the use of moving parts. It comprises an inclined porous medium, which supports a stream of material, sufficiently fluidized, by low-pressure air passing through the medium, that gravitational force causes the material to flow. Clean, quiet, no lubrication, power cost low, about one-tenth of that required by a screw conveyor for the same capacity. Eliminates expensive drives, such as chains, belts, and speed reducers.

THE AIRVEYOR: A pneumatic conveying system for unloading dry pulverized and granular materials from trucks, cars, ships and barges; also conveying to storage and reclaiming from storage for delivery to process in the plant. Capacities range from a few tons an hour to 300 tons, (ship unloading) with one unit. Eliminates loss of material; dust nuisances overcome when handling highly dusty materials. One man can operate the average system.

G-50

WHEN YOU HAVE A CONVEYING PROBLEM, CONSULT

FULLER COMPANY, CATASAUQUA, PA.

Chicago 3 - 120 So. LaSalle St.
San Francisco 4 - 420 Chancery Bldg.

FULLER

"Me . . . stock all those endless V-Belt sizes?"

"Not since I use VEELOS"

"I can replace any V-belt in our plant with just these reels of Veelos."

That's a typical Veelos user telling you how Veelos cuts V-belt inventory. If you use O, A, B and C widths, four reels of Veelos give you a choice of more than 316 sizes. Use only A and B? Then two reels are all you need.

Buying matched sets of endless V-belts is costly. Forget it with Veelos. Forget, too, belt deterioration and obsolescence. Veelos on reels saves storage space . . . simplifies stock records.

Veelos is quickly and easily installed. On drives with fixed centers or outboard bearings, Veelos is installed without moving the motor or dismantling the machine. It provides substantial savings in installation and maintenance costs.

SEND FOR FREE VEELOS CATALOG. It shows how you can benefit from the many important advantages of Veelos. Fully illustrated. Complete engineering data. Write for it.

MANHEIM MANUFACTURING & BELTING COMPANY
MANHEIM, PA.

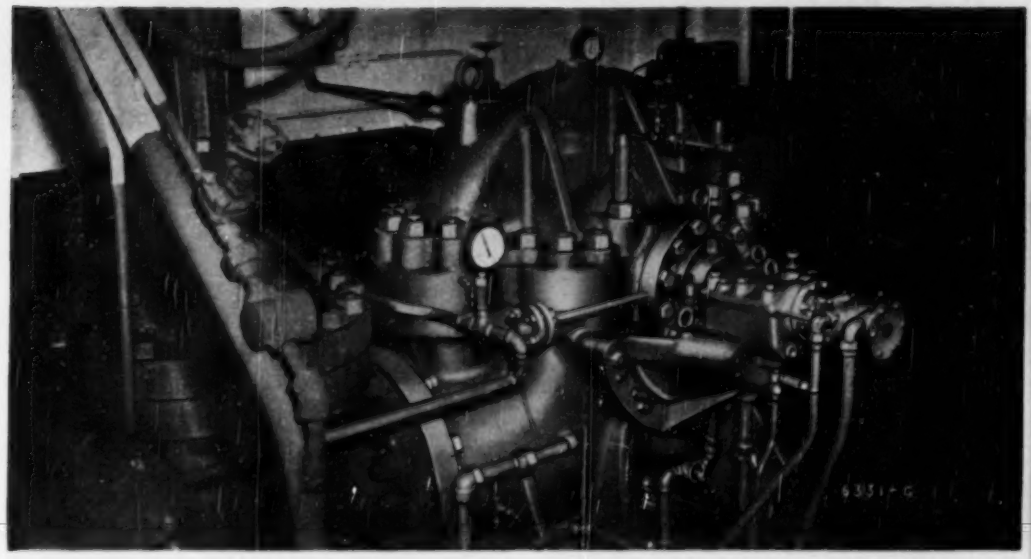
VEELOS
THE LINK
V-BELT

ADJUSTABLE TO ANY LENGTH · ADAPTABLE TO ANY DRIVE

Made in all standard sizes, fits all standard grooves. Packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 300 distributors throughout the country. Veelos is known as VEELINK outside the United States.

PRESSURES AT 1000 PSI

NOW PRACTICAL WITH CENTRIFUGAL COMPRESSORS



One of the new De Laval high pressure centrifugal compressors now pumping gas through the Big and Little inch pipelines.

The inherent advantages of the centrifugal compressor—*output flexibility, compactness, simplicity* and *high capacity*—are no longer limited to relatively low pressure service.

The development of a highly satisfactory shaft seal, coupled with other improvements in design, enables us to furnish centrifugal compressors for operation at pressures approaching 1,000 psi. These machines have given thousands of hours of continuous, trouble-free service. No mechanical failures have been experienced, gas leakage past the shaft seal has been nil and efficiency guarantees have been met.

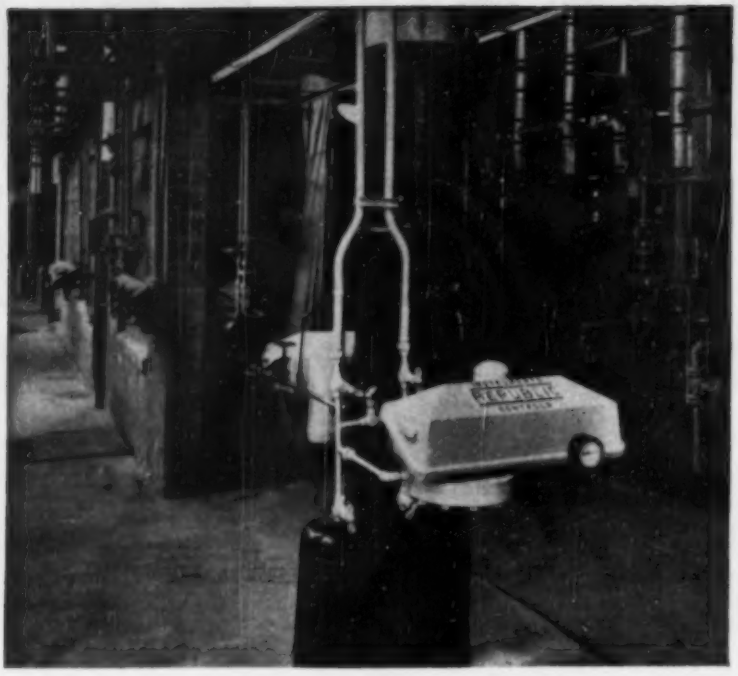
SEND FOR CATALOG 03-12-M

DE LAVAL STEAM TURBINE COMPANY, TRENTON 2, N. J.

DE LAVAL

TURBINES • HELICAL GEARS • CENTRIFUGAL BLOWERS AND COMPRESSORS
CENTRIFUGAL PUMPS • WORM GEAR SPEED REDUCERS • IMO OIL PUMPS

C-12



These Meters Had To Be
ACCURATE — FLEXIBLE — RUGGED

One hundred twenty one Republic Pneumatic Transmitters are measuring the flow and level of various acids in a large chemical processing plant, a section of which is pictured above.

These transmitters have a guaranteed accuracy of within ½ of 1% of the transmitter range. By making a few minor adjustments or substituting a few small parts, their operation can be easily changed to any desired range between a minimum of 0—0.6" of water to a maximum of 0—704" of water. Their construction is more like that of a precision machine than of the sensitive instrument they are. It is for these reasons that Republic Pneumatic Transmitters, even though comparatively new, have already been specified and installed on over 2500 industrial metering applications.

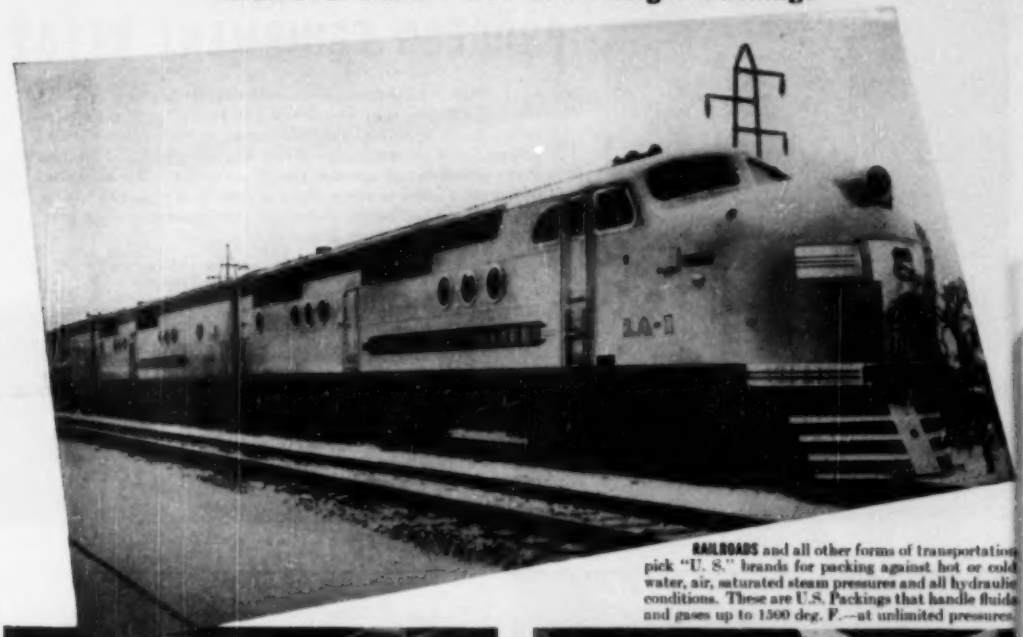
Republic Pnuematic Transmitters are available for measuring flow, liquid level, pressure or liquid density of a wide range of fluids. They employ the force-balance principle to convert these process variables into air pressures which vary proportionally. These air pressures become direct measurements and can be conducted to reading instruments or used as the measuring impulse for the actuation of an automatic controller.

Data Book No. 1001 contains complete details on the construction and operation of Republic Transmitters. Write for your copy today.

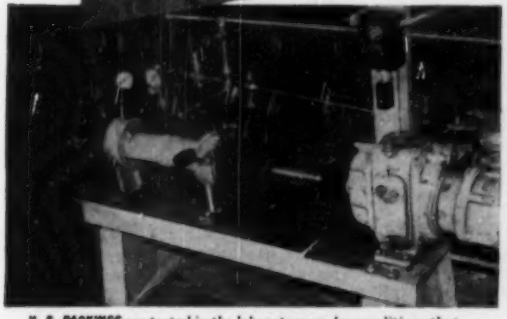
REPUBLIC FLOW METERS CO.
2240 Diversey Parkway, Chicago 47, Illinois

PACKINGS FOR EVERY NEED

Every field of Industry and Transportation saves money with U. S. Rubber Rod and Plunger Packings



RAILROADS and all other forms of transportation pick "U. S." brands for packing against hot or cold water, air, saturated steam pressures and all hydraulic conditions. These are U.S. Packings that handle fluids and gases up to 1500 deg. F.—at unlimited pressures.



U. S. PACKINGS are tested in the laboratory under conditions that are more difficult than they will encounter on the job. The specially designed centrifugal pump (above) duplicates various working conditions to determine the service life of packings.

SOLVENTS in a solution used by this Oliver Dewaxing Filter took the lubrication out of the packings. "U. S." provided a packing which withstood the solvents. There is a U. S. Packing for any job, from ammonia to destructive chemicals at high pressures.

You get absolute reliability of performance from any member of the complete line of U. S. Rubber Company packings. Constant research carried on in the most modern physical and chemical laboratories guarantees the finest in design, materials and workmanship. Whatever your packing problem, it will pay you to consult a "U. S." engineer. Write to address below.

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UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

DRAW ON BLAW-KNOX INGENUITY, SKILL, EXPERIENCE FOR YOUR PROCESS EQUIPMENT NEEDS

Save time and expense—eliminate problems—rely on Blaw-Knox pre-engineered and pre-proved process equipment. From a half gallon laboratory autoclave to a 3000 gallon 5000 psi unit, Blaw-Knox has designed and built so many pressure and thermal reaction vessels that a minimum of time is needed to adapt designs exactly to your needs. Our long, varied and successful experience guarantees economical and efficient operation.

Shall we send you Bulletin No. 2197 with brief descriptions of many standard Blaw-Knox process plant units?

PROCESS EQUIPMENT DEPARTMENT

BLAW-KNOX

DIVISION OF BLAW-KNOX COMPANY
2000 FARMERS BANK BLDG., PITTSBURGH 22, PA.
Other Offices in Principal Cities

HERE'S YOUR *Complete* STEAM PLANT

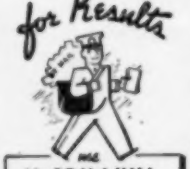
A complete steam plant backed by undivided responsibility • Shipped completely assembled • More than 80% thermal efficiency guaranteed • 4-pass design provides 5 sq. ft. of heating surface per b.h.p. • Built-in induced draft eliminates need of expensive chimney • Simple installation • Clean, quiet operation • Heavy-duty construction assures long-lived dependability • 17 sizes from 20 to 500 b.h.p. for pressures up to 250 p.s.i. or for hot water heating.

For complete details write for catalog 222.

Superior STEAM GENERATORS

SUPERIOR COMBUSTION INDUSTRIES, Inc.
Factory: Emmaus, Pa.
Executive Offices: Times Building, Times Square, New York 18, N. Y.

for Results



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SULPHUR

*Interesting Facts Concerning This Basic Raw Material from the Gulf Coast Region

*BLASTING

Sulphur is blasted from the face of the vat as it is required for shipment. Vertical holes are drilled from the top of the vat, each hole being charged and exploded. Most of the sulphur is thereby broken into pieces of a size suitable for loading, such large pieces as occur being broken by hand to sizes which can be conveniently handled. Locomotive cranes load the sulphur into railroad gondolas, hopper bottom, or box cars. Such molten sulphur as is shipped is loaded direct from the pipe lines bringing sulphur from the producing wells.

Loading operations at one of the huge vats of Sulphur at our Newgulf, Texas mine. Such mountains of Sulphur are constantly being built at our mines, from which shipments are continually made.

TEXAS GULF SULPHUR CO. INC.

75 East 45th St. New York 17, N. Y.

Mines: Newgulf and Moss Bluff, Texas

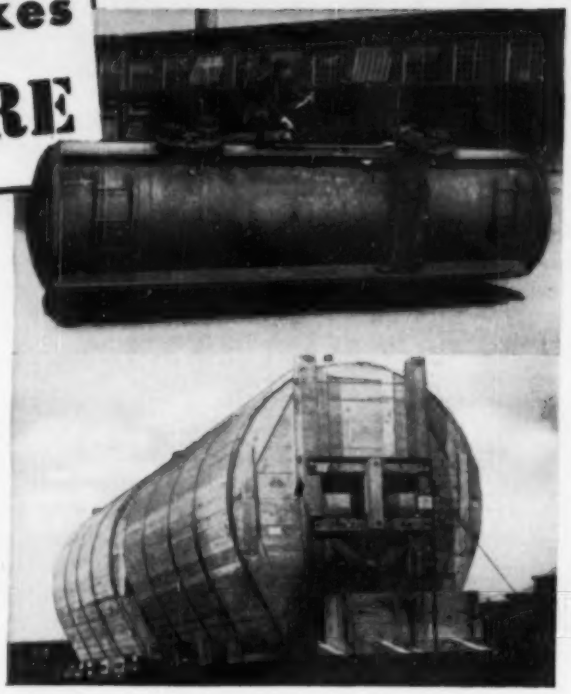
Manhattan Takes EXTRA CARE

BEFORE...

Manhattan Engineers measuring outlets on a truck chemical tank prior to lining.

and AFTER

Two continuous vacuum filter drums (for filtering an organic by-product) ready for shipment showing careful method of crate protection.



Rubber Lining Your Equipment

We have often stressed Manhattan's craftsmanship and facilities for rubber lining equipment of all sizes and shapes . . . But there is more to a good job than care *during* the rubber lining process. The scenes shown here of different tanks are typical of Manhattan care *before* rubber lining and *after* rubber lining.

Manhattan engineers go all over a piece of equipment before work is started on it. They take accurate measurements of such things as outlets and make sure that all specifications are accurate. These preliminary precautions avoid costly error and delay.

After equipment is rubber-lined, Manhattan shippers use every means to protect the job and make sure it arrives at its destination in perfect condition. A little extra expense and care in crating or boxing a tank is just good Manhattan insurance against accidental damage that could waste many days of production and dollars of capital.

Your equipment is safer all around at Manhattan. Where tank lining experts have established more than 40 years of leadership. Their technique of permanently bonding rubber to metal is unchallenged. Their ability to handle all shapes and sizes of equipment that can be transported is your assurance that your job will be done right. If you have never tried Manhattan call us in on your next rubber lining problem.

Is This Folder in Your File?

It describes Manhattan Rubber Lining techniques and covers other rubber products. A copy will be mailed to you without obligation. Ask for Bulletin MR-557.

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose • Fan Belts • Brake Linings • Brake Blocks • Clutch Facings • Packings • Asbestos Textiles • Powdered Metal Products • Abrasive & Diamond Wheels • Bowling Balls

CHEMICO P·A VENTURI SCRUBBER

STOPS ACID FUMES

THESE PHOTOGRAPHS—taken at a pigment plant in Pennsylvania—show how effectively the Chemico P-A (Pease-Anthony) Venturi Scrubber solves the problem of waste sulfuric acid fumes. Instead of pouring from the large stack, the fumes are diverted into the Chemico unit. An infinitesimal residue is emitted through the small stack at the left of the brick chimney. The P-A Venturi Scrubber, in fact, eliminates the need for a large stack.

HERE ARE THE ACTUAL RESULTS OF THIS INSTALLATION:

Sulfuric Acid Mist Loading

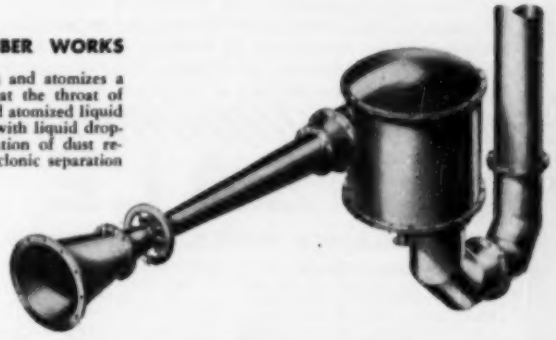
INLET TO SCRUBBER	EXIT FROM SCRUBBER	EFFICIENCY
283 mg H_2SO_4 per cu ft	1.06 mg per cu ft	99.6%

The P-A Venturi Scrubber is highly effective and very economical to install and operate. It is recommended for (1) smoke abatement, (2) removal of dust and mist from gases and (3) recovery of valuable metals and chemicals.

This Chemico unit is simple and safe to operate and maintain. Any competent maintenance man can service a P-A Venturi Scrubber. No special skill is needed. Write us concerning your problem.

HOW THE P-A VENTURI SCRUBBER WORKS

Dirty gas, at high velocity, impinges upon and atomizes a curtain of liquid introduced through jets at the throat of the Venturi. Differential velocities of gas and atomized liquid result in collision of mist or dust particles with liquid droplets. The coalescence of mist or agglomeration of dust resulting from this collision makes simple cyclonic separation possible.



CHEMICAL CONSTRUCTION CORPORATION

A UNIT OF AMERICAN CYANAMID COMPANY

EMPIRE STATE BLDG., 350 FIFTH AVENUE, NEW YORK 1, N. Y.

EUROPEAN TECHNICAL REPRESENTATIVE
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CC 194

Chemico Plants are Profitable Investments

DEPARTMENT OF THE ARMY

INDUSTRIAL FACILITIES

FOR LEASE

AMMONIA & METHANOL PLANTS

SAN JACINTO ORDNANCE WORKS
Houston, Texas

This Anhydrous Ammonia Plant is now in operation. Facilities newly completed. Capacity per month: 2,100 tons of anhydrous ammonia.

District Engineer, Galveston District

MORGANTOWN ORDNANCE WORKS
Morgantown, West Virginia

Ammonia and Methanol Plant — Plant currently in ammonia production only. Capacity per month: 18,700 tons of anhydrous ammonia, or 4,000,000 gallons of refined methanol plus 5,000 tons of anhydrous ammonia.

Hexylamine—Capacity per month: 4,000,000 lbs. • *Formaldehyde*—Capacity per month: 9,200,000 lbs. Coke ovens not available.

District Engineer, Louisville District

SOLUTION PLANTS

JOLIET ARSENAL
Joliet, Illinois

Solution Plant — Capacity per month: 28,000 tons of ammonium nitrate solution as 100% ammonium nitrate in the form of 82% to 83% solution. Nitric acid facilities for this production are also available.

District Engineer, Chicago District

INDIANA ARSENAL
Charlestown, Indiana

Solution Plant — Capacity per month: 20,000 tons of ammonium nitrate solution as 100% ammonium nitrate in the form of 82% to 83% solution. Nitric acid facilities for this production are also available.

District Engineer, Louisville District

GRAINING PLANTS

RAVENNA ARSENAL
Apco, Ohio

Capacity per month: 23,000 tons of grained ammonium nitrate.

District Engineer
Louisville District

•

IOWA ORDNANCE PLANT
Burlington, Iowa

Capacity per month: 14,000 tons of grained ammonium nitrate.

Division Engineer
Missouri River Division

•

NEBRASKA ORDNANCE PLANT
Mead, Nebraska

Capacity per month: 25,000 tons of grained ammonium nitrate.

Division Engineer
Missouri River Division

All leases will be consummated through competitive bids. Sealed bids for the lease of these facilities will be received at the office of the Division or District Engineer having jurisdiction. Detailed information, arrangements for inspections and bid forms may be obtained from the Real Estate Division of the Division or District in which each plant is located.

FOR SALE

OHIO RIVER ORDNANCE WORKS, HENDERSON, KY.

This Anhydrous Ammonia Plant, capacity 6000 tons per month, constitutes a part of the National Industrial Reserve and has been designated for disposal subject to the National Security Clause.

All facilities, equipment and machinery are in excellent condition. The plant is currently being operated by the Solvay Process Division of Allied Chemical and Dye.

This plant is offered for sale under the provisions of Public Law 152—81st Congress, and is subject to priorities to other Federal Agencies.

Sale will be consummated through competitive bids. Sealed bids for the purchase of this facility will be received at the office of: District Engineer, Louisville District.

MISSOURI RIVER DIVISION
Corps of Engineers
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CORPS OF ENGINEERS U. S. ARMY WASHINGTON, D. C.

AHCO Detergent 240

A Synthetic Detergent Derived from Petroleum

For general use in detergent mixtures and compatible with alkalies such as phosphates and carbonates.

- Efficient in hard water
- 1% solution has a pH of 7.5–8.0
- Buff-colored, dry, non-hygroscopic compound, in flake or powder form.
- Packed in fibre drums holding approximately 200 lbs.

AHCO

ARNOLD, HOFFMAN & CO. INC.

Manufacturing Chemists • Established 1815

Plants at Dighton, Mass., Charlotte, N. C., & Cincinnati, O.

PROVIDENCE

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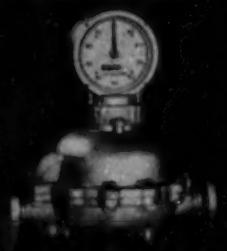
Automatic Liquid Volume Control



with NIAGARA *Electricontact* METERS

SAVES LABOR
INCREASES ACCURACY

Niagara Meters for any commercial liquid are combined with a precision electric contact to provide automatic shut-off for such operations as 1) stopping the flow of liquid through the pipe 2) shutting off a pump motor 3) visual or audible signal to operator. Increase processing accuracy — with dependable Niagara *Electricontact* Meters!

Send Coupon for complete data!

Please send me full information on use of your Niagara *Electricontact* Meter for:

Liquid .....

Temp..... °F. Pressure.....p.s.i.

Flow rate .....g.p.m.

Maximum Batch .....gals.

Company .....

By .....

Address .....

BUFFALO METER CO.

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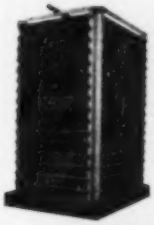
BUFFALO, N. Y.



BINKS TYPE S *natural draft* cooling tower

HEAVY-DUTY ROTOJET NOZZLE available in many sizes

BINKS COOLING TOWERS and INDUSTRIAL NOZZLES for chemical processing

money-saving COOLING SYSTEMS matched to your needs

Binks manufactures a full line of cooling equipment, including natural and mechanical draft cooling towers . . . nozzles for spray pond and various cooling applications . . . spray nozzles for industrial and chemical processes.

Binks towers are widely used for low-cost cooling in manufacturing and chemical processes where heat is dissipated by circulating fluids . . . for cooling water-jacketed engines . . . for cooling condenser circulating water from refrigeration and air conditioning compressors.

BINKS TYPE S *mechanical draft* cooling tower

ROTOJET NOZZLE showing whirl-chamber principle

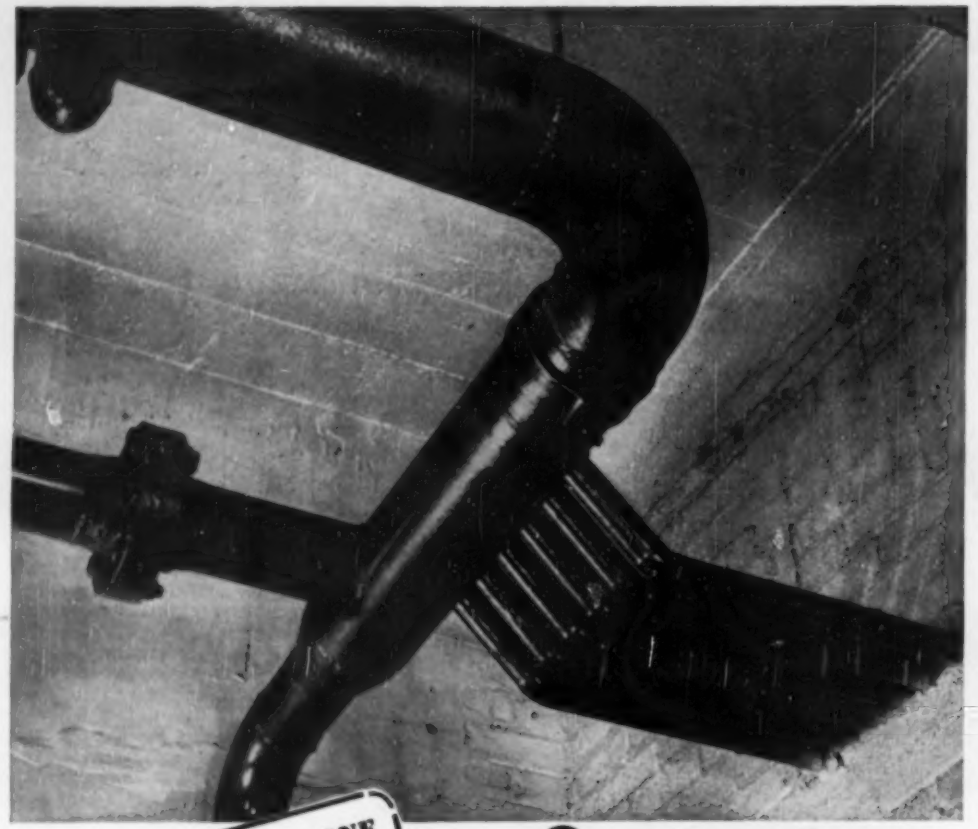
Send for handy reference book on Binks towers and spray nozzles

Binks MANUFACTURING COMPANY

3114-32 Carroll Avenue, Chicago 12, Ill.

Representatives in all principal cities.

How to Tame a Tough Joint



ANOTHER JOB DONE BETTER WITH GLOBE WELDING FITTINGS

KEEP an eye on the future when you install piping — even the most innocent looking connection can become a "tough joint" through leakage — pressure-loss — the focal point for erosion and corrosion — constant maintenance time and cost.

You can tame probable "tough joints" in piping by making connections with permanently tight, leakproof Globe Welding Fittings. Strength is forged in the fittings — flow friction and pressure-loss minimized by precision formed true angles, radii, circularity—weight and space requirements reduced—exact dimensional accuracy that saves time, speeds piping assembly. To do any piping job better — use Globe Welding Fittings produced from Globe seamless steel tubes by the Globe Precision Process.

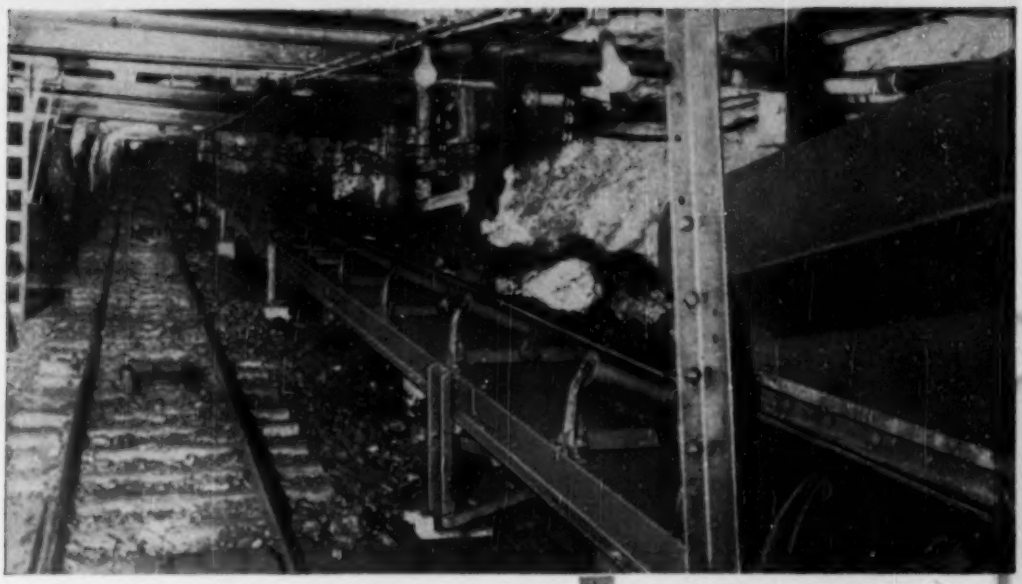
GLOBE STEEL TUBES CO., Milwaukee 4, Wis.

Producers of Globe seamless stainless steel tubes — Gloweld Welded stainless steel tubes — carbon — alloy — seamless steel tubes — Globeiron seamless high purity ingot iron tubes — Globe welding fittings.

For complete information on sizes and types send for Globe Welding Fittings Catalog.

GLOBE PRECISION PROCESS WELDING FITTINGS

12,500,000 TONS HANDLED...



was just a start for Rex Idlers

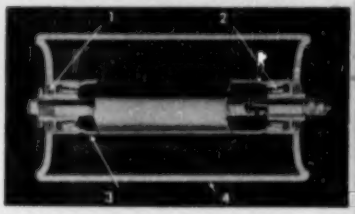
You'd think that carrying 12,500,000 tons of material would be a lifetime job for any belt conveyor idlers. After these rugged Rex Idlers handled that amount of aggregate for the Shasta Dam as a starter, the same idlers were installed on the longest, highest belt slope conveyor in regular service. And they're still going strong.

That's real proof that Rex Belt Conveyor Idlers give you lowest cost service . . . that they eliminate costly down time caused by premature idler failures. Not only do Rex Idlers last longer, they also are easy on the belt. They eliminate destructive belt pinching and creasing, and absorb practically no power. Special application idlers, such as Rex Impact Cushioning Idlers illustrated above (lower right hand corner), installed under loading points, protect belt from laceration and carcass failures.

For the complete story on these cost-cutting idlers, mail the coupon for your copy of Bulletin No. 463R.

REX BELT CONVEYOR IDLERS

These Rex Quality Features Add Life to Your Conveyors



1 Triple labyrinth grease seal . . . dust stays out, grease stays in.

2 Tapered roller bearings, deadshaft type mounting, oversize capacity.

3 Unit mounting for bearings for positive alignment and minimum friction.

4 Heavy duty one-piece welded steel construction for maximum roll life.

CHAIN BELT COMPANY
1648 West Bruce Street
Milwaukee 4, Wis.

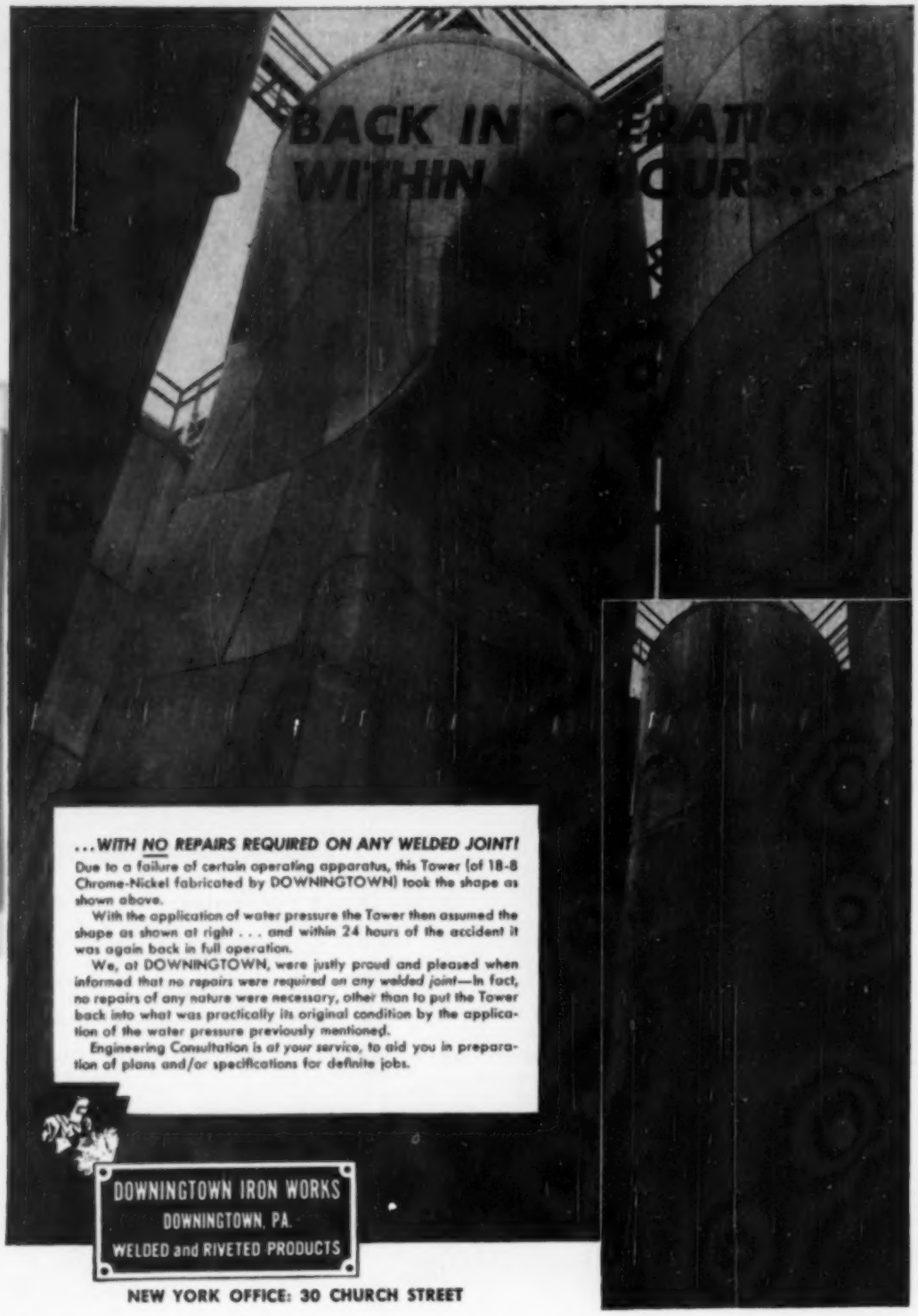
Gentlemen:
☐ Send me my copy of Bulletin No. 463R.
☐ I would like to see a Rex Field Sales Engineer.

Name.....

Company.....*Dept*.....

Address.....

City.....*State*.....



...WITH NO REPAIRS REQUIRED ON ANY WELDED JOINT!

Due to a failure of certain operating apparatus, this Tower (of 18-8 Chrome-Nickel fabricated by DOWNINGTOWN) took the shape as shown above.

With the application of water pressure the Tower then assumed the shape as shown at right . . . and within 24 hours of the accident it was again back in full operation.

We, at DOWNINGTOWN, were justly proud and pleased when informed that *no repairs were required on any welded joint*—In fact, no repairs of any nature were necessary, other than to put the Tower back into what was practically its original condition by the application of the water pressure previously mentioned.

Engineering Consultation is at your service, to aid you in preparation of plans and/or specifications for definite jobs.

DOWNINGTOWN IRON WORKS
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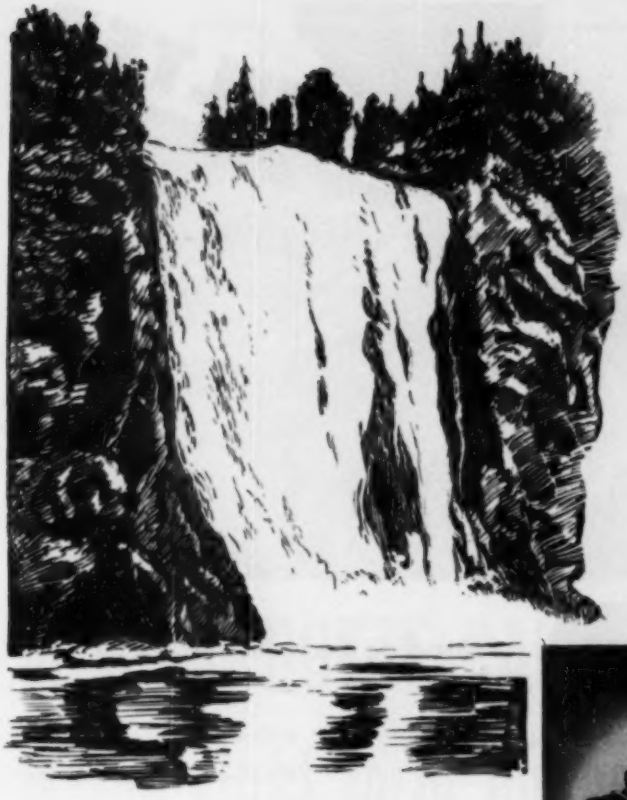
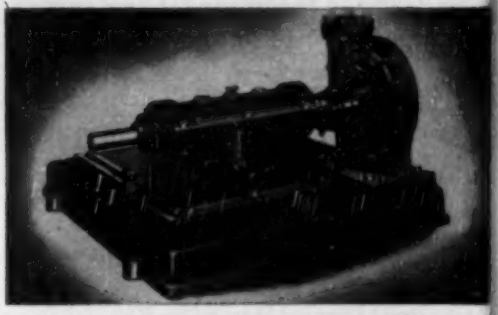


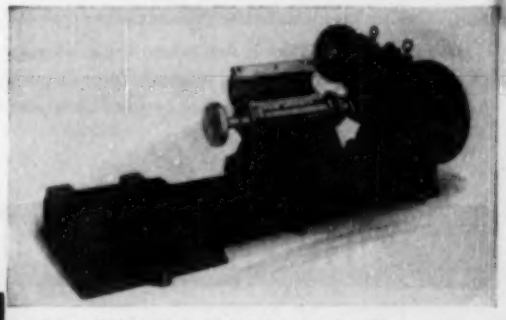
VITAL TO THE CONTINUOUS PROCESS . .

UNINTERRUPTED FLOW with "Buffalo" CHEMICAL PUMPS

• In many chemical installations, the batch process has given way to the continuous process. And with the multiplied economies of this trend, the pump takes on even more importance — for the process depends on uninterrupted flow. The *complete* line of trouble-free "Buffalo" Pumps is giving this uninterrupted flow in every chemical industry today—whatever the liquid, whatever the conditions of pressure, temperature and volume. Back up your process with "Buffalo" Pumps, and you'll avoid shutdowns that eat up profits. For complete facts, write:



Above, "Buffalo" Lead-Acid Pump, one of many special designs for handling your chemical liquids under your conditions, for continuous or intermittent processes.



Above, "Buffalo" Rubber-Lined Pump for handling corrosive chemicals. Diagonally split-shell pump casing permits inspection without removing discharge piping.

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501 BROADWAY . . . BUFFALO, N. Y.
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OLIVER HORIZONTAL FILTER

VERSATILE

FAST FILTERING

EXCELLENT WASHING

Handling Such Products as:

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- Sodium Ferrocyanide
- Potash
- Carbon
- Zinc Chloride
- Ammonium Sulphate
- Agar
- Cotton Linters

Keep in mind these three features of the Oliver Horizontal Filter:

(1) cake formation aided by gravity

(2) washing features: wash solutions in varying strength can be applied where desired; filtrate from various sections can be kept separate

(3) all operations are visible: feed, cake forming, wash application and cake discharge

At the recent Chemical Show in New York, this Oliver Horizontal Filter created more interest seemingly than all the filters combined. Hundreds came into our booth to discuss its application. It can really take care of many filtering problems better than any other type of filter.

If you have *any* filtering step where the products are relatively free-filtering, you should investigate its merits for your problem. In sending for Bulletin No. 218, which gives more details, tell us your filtering problem.

OLIVER UNITED FILTERS INC.

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Chicago—221 N. La Salle Street
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Factories: Hazleton, Pa. • Oakland, Calif.

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17 of these forms of WYANDOTTE CAUSTIC SODA is the right form for you

50% LIQUID
74% LIQUID
SOLID
STANDARD FLAKE
1/4" FLAKE
CRYSTAL
POWDERED FLAKE

No matter what form of Caustic Soda you are using now, there is the chance that you could use another of the seven forms listed above to better advantage.

Transportation, storage and handling costs are important considerations, too. Have you checked the economies of using liquid as opposed to solid caustic soda, or the savings per ton that can be realized in using 74% liquid caustic rather than the 50% concentration? In some instances it may even be to your advantage to use 50% rather than 74% concentration. Our Technical Service staff will be glad to investigate these factors with you.

If you would like to know more about modern procedures for analyzing certain alkali chemicals, write for a free copy of the Wyandotte booklet, "Analysis of Caustic Soda, Soda Ash, Bicarbonate of Soda."

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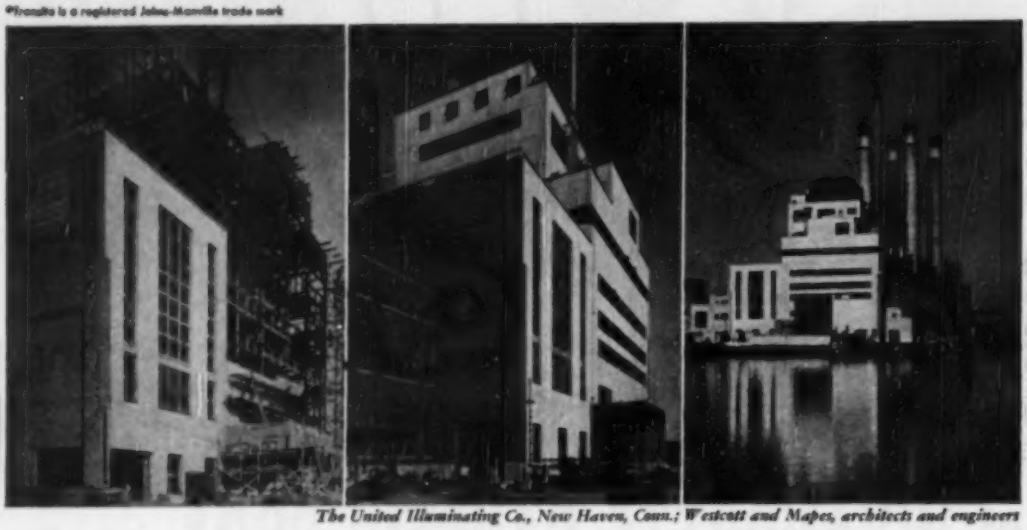
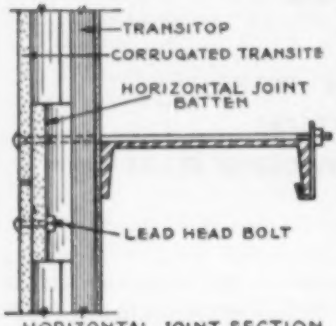
*Transite is a registered Johns-Manville trade mark



The United Illuminating Co., New Haven, Conn.; Westcott and Mapes, architects and engineers

Asbestos Corrugated Transite reduces load-bearing factor 83% on new power plant addition! Transite sheets give attractive, streamlined appearance ... and they can't rot, rust, or burn.



HORIZONTAL JOINT SECTION

● Here's a case in which a unique form of asbestos wall construction solved a tough building problem.

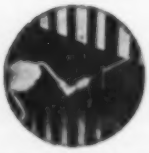
The addition planned was to be almost twice the height of the original building, yet where the two joined, existing foundations were to be used. This meant that the new bearing wall with all its extra height should weigh no more than the old wall.

After careful study, it was decided to use the Johns-Manville Industrial Curtain Wall, a system of dry wall construction which combines J-M Corrugated Asbestos Transite with J-M Transitop (Insulating Board faced with Flexboard).

This type of construction, compared with solid masonry, reduced the load-bearing factor from 120 to 20 pounds per square foot! It also provided fire protection, insulation, and permitted the use of less extensive pilings and foundations for the rest of the building.

Architects and engineers are constantly discovering new uses for J-M Corrugated Asbestos Transite, not the least of which is its surprisingly effective function in attractive, modern design.

Send for new brochure which may help you on your next project. Johns-Manville, Box 290, New York 16, N. Y.



EASY TO BOLT TO STEEL

EASY TO SAW

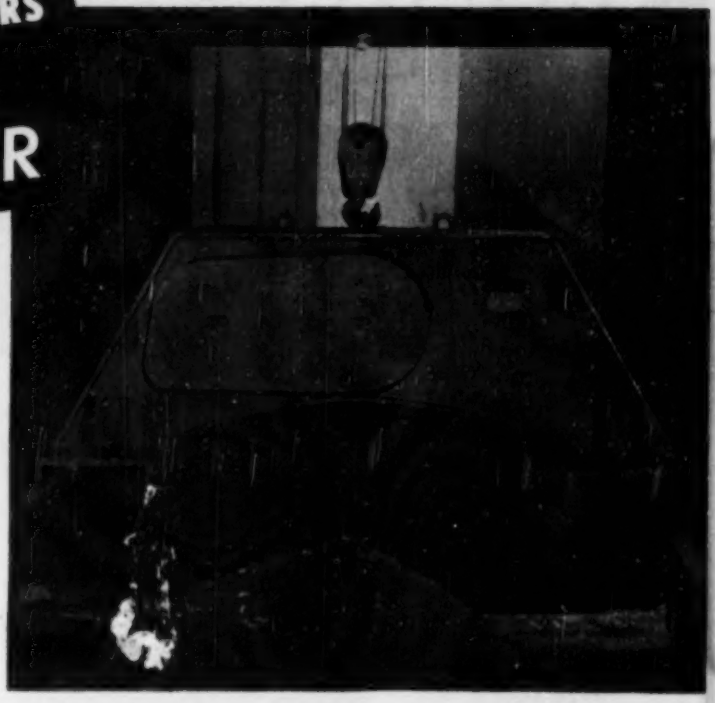
EASY TO DRILL

EASY TO NAIL TO WOOD

Johns-Manville *Asbestos* **CORRUGATED TRANSITE**

Save Up To 90% Time Unloading Cars!

ALLIS-CHALMERS
CAR SHAKER



- Simplified design with entire drive protected by heavily reinforced steel body.
- Motor protected from shock and impact by field-proven vibration isolation mountings.
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- Minimum number of parts in mechanism. Oversize bearings provide long life.
- Shaker fits all hopper-bottom cars operating on North American continent.

YES, with the new Allis-Chalmers Car Shaker a gondola car can be unloaded in as little as two minutes! Manual unloading the same car would take over 30 minutes.

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Here's how it works: High frequency vibratory motion of the Car Shaker is transmitted to the car and loosens bridged material so it flows freely through the hopper openings.

A single responsibility, *completely* Allis-Chalmers built product, the Shaker is driven by a 15 hp high torque, totally enclosed Allis-Chalmers motor and *Texrope* drive. Weighing approximately five tons, the all-welded unit is 11 ft long, 5 ft wide and 4 ft 4 in. high.

For complete information on how this Car Shaker can save *you* time and money, contact your nearby A-C Sales Office. Or send in the coupon below.

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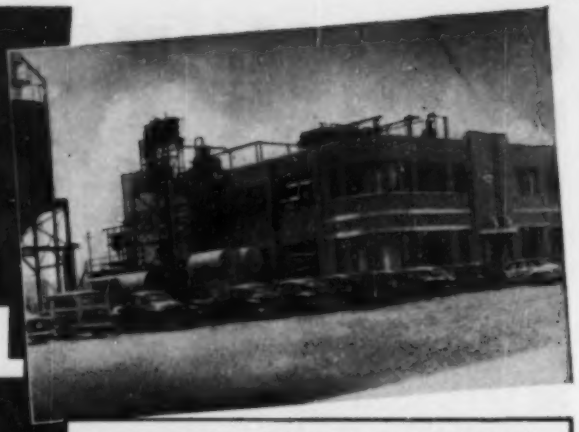
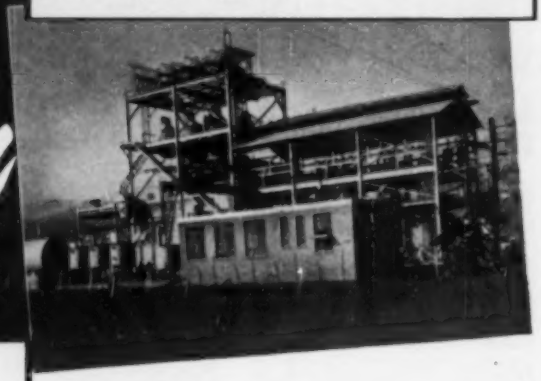


From coal mine and through Tepco Coke Plant and then through these two new modern Fine Chemical Plants, every step of Tepco production is under close control by our laboratories.



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See footnote for additional listing

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COPPER ALLOY BULLETIN

REPORTING NEWS AND TECHNICAL DEVELOPMENTS OF COPPER AND COPPER-BASE ALLOYS

Prepared by Bridgeport Brass Company "Bridgeport" *Headquarters for BRASS, BRONZE, and COPPER*

Use of Increased Water Velocity Helps Keep Condenser Tubes Clean

Large fouling organisms and certain slimes on condenser tube surfaces can be controlled by increased water velocities through the tubes. At water velocities over one to three feet per second most marine life cannot attach itself to tube surfaces. Higher velocity may also aid in preventing certain suspensions of industrial origin, wastes, etc. from adhering to the tube surface.

Dangers of Fouling

Where debris partially blocks off tubes for any length of time, the water velocity through the tubes affected may drop sufficiently to allow fouling organisms to attach themselves.

Once marine organisms have gained a foothold, higher water velocities will not dislodge them.

Difficulty can be anticipated in condensers and heat exchangers operating at low water velocities, using water containing embryos of marine organisms. The organisms which attach themselves to condenser tubes vary considerably with localities.

The difficulties encountered due to organisms in tubes, on tube sheets and water boxes occur chiefly along four lines. First, blockage of condenser tubes markedly reduces the heat transfer of the condenser. Secondly, large masses of marine growth may restrict the flow of water so seriously that a high back pressure may damage pumps and associated piping. Third, during periods of shutdown incomplete removal of dead organisms will initiate corrosion pitting. Fourth, in the chemical and petroleum processing fields, such blocking of tubes can produce even greater complications. Often the heat of the products being cooled is so high that if this heat is not carried away immediately by the cooling medium, the metal in the tubing will be greatly expanded. This thermal expansion in certain instances has caused permanent distortion, buckling, breakage and loosening of tubes in tube sheets. Not only is costly maintenance involved but leakage naturally causes contamination of the products.

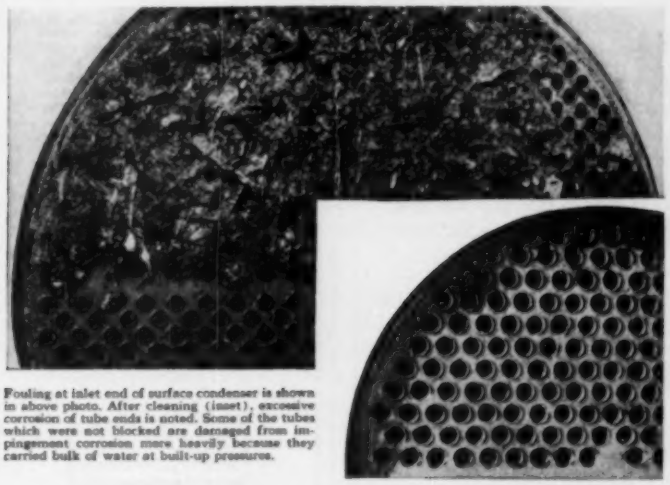
Other Effects of High Velocities

The use of high water velocities is also beneficial in preventing clays, hydrated iron oxides, hydrated aluminum oxides and other materials from attaching themselves to the tube walls. Sometimes water velocities in excess of seven feet per second and approaching 10 or 12 feet per second, appear to be required to prevent the deposition of certain suspended materials from the water on to tube surfaces. For various reasons it is not always feasible to attain these high water velocities.

The use of water velocities in the order of five to seven or more feet per second requires the use of settling basins, screens or strainers in order to eliminate debris from the water before it reaches the condensers.

Where water velocities in excess of six or seven feet per second are contemplated to keep tubes clean, it is advisable to proceed with caution since considerable damage can occur over a short period of time due to impingement corrosion at the inlet ends of condenser tubes or where the water flows around objects lodged in condenser tubes. In fact, even at six and seven feet per second, the finest and most corrosion resistant copper-base alloys are vulnerable to attack under such adverse conditions.

In some inland power plants water velocities as high as 10 feet per second have been used to keep condenser tubes clean and maintain high heat transfer rates. This has been possible where relatively little sand was suspended in the water, in the absence of debris and where the composition of the water was such that it was non-corrosive toward copper-base condenser tube alloys.



Fouling at inlet end of surface condenser is shown in above photo. After cleaning (inset), excessive corrosion of tube ends is noted. Some of the tubes which were not blocked are damaged from impingement corrosion more heavily because they carried bulk of water at built-up pressures.

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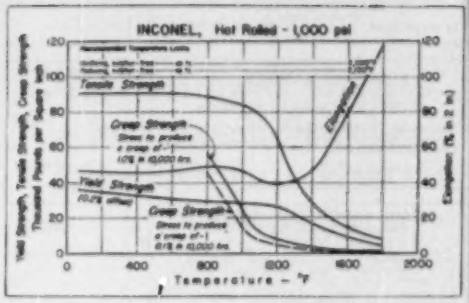

INCONEL IS STRONG

Strength, especially *hot-strength*, is the quality designers look for first in metals to be used in high-temperature applications.

INCONEL* *has exceptionally high hot-strength.*

In the heat-treating field, where equipment is constantly exposed to red-heat temperatures, INCONEL has repeatedly set long-time performance records. One fixture made of INCONEL carried full work loads for 13,000 consecutive hours at operating temperatures of 1600° to 2150° F.

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Get a quotation on INCONEL. You will find it less than you would probably expect. In addition, INCONEL's superior service life and low maintenance requirements often result in outstanding long-run economies.

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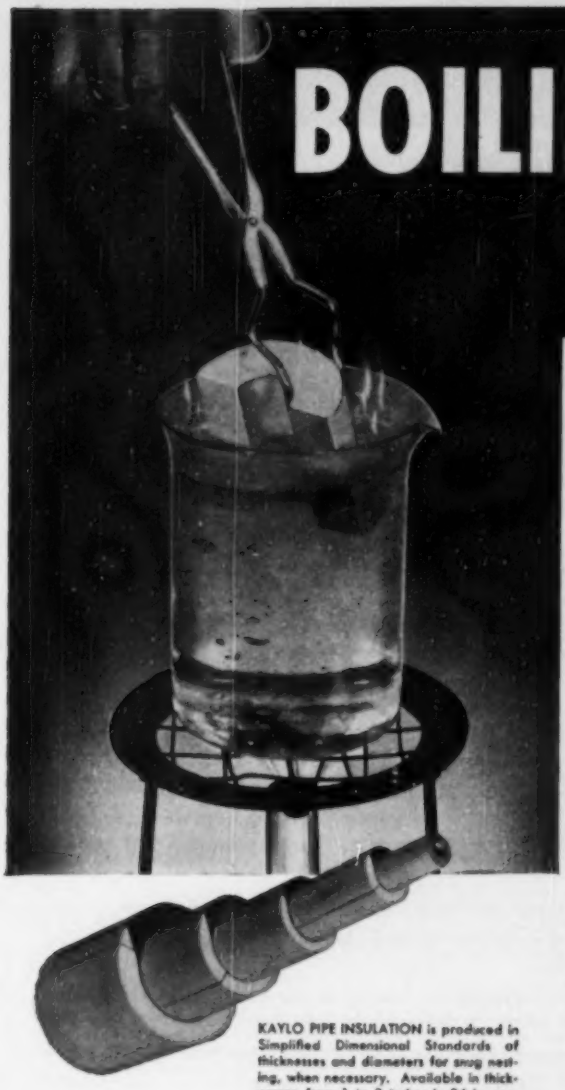

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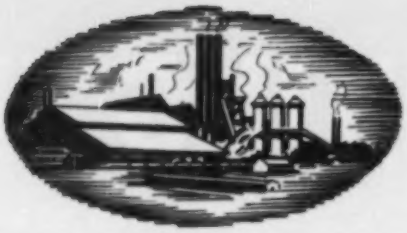
ADDRESS.....

CITY.....STATE.....



1900 ★ THE MIRACLE OF AMERICA ★ 1950

Freedom and Progress

It's no stretch of the imagination, rather, robust realism to call our past half century a Miracle—U. S. A.

America has set an amazing record of progress in 50 years—but a moment in the history of civilization. A record unequalled by any other political or economic system.

Merely by broad brush strokes, we can all visualize this miracle. Remember the crystal set, the hand-cranked car, the biplane? A far cry from our FM radio, television, hydro-matic drive and supersonic planes.

And here's another phase of the miracle that went hand-in-hand with these and the myriad of intertwined technological advances—ranging from the radio telephone and Bakelite to the X-ray tube and teletype . . . and to atomic energy and its untold potentialities.

- Since 1900 we have increased our supply of machine power 4½ times.
- Since 1900 we have more than doubled the output each of us produces for every hour we work.
- Since 1900 we have increased our annual income from less than $2400 per household to about $4000 (in dollars of the same purchasing power), yet . . .
- Since 1900 we have cut 18 hours from our average work week—equivalent to two present average workdays.

How did we do it? The basic cause for this composite miracle has been the release of human energy through FREEDOM, COMPETITION and OPPORTUNITY. And one of the most important results is the fact that more people are able to enjoy the products of this free energy than in any other system the world has ever known.

THIS IS THE MIRACLE OF AMERICA . . . it's only beginning to unfold.

A PUBLIC SERVICE PROJECT · THE ADVERTISING COUNCIL ·

Published in the public interest by:

McGRAW-HILL PUBLICATIONS

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

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(Not available for equipment advertising)
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NEW ADVERTISEMENTS received by 10 A. M. February 27th will appear in the March issue subject to limitations of space available

ENGINEERS
CHEMICAL and METALLURGICAL
RES. DIR. Ph.D. plastics.....$15,000
CH. ENG. Tech. Serv. paints.....open
CH. ENG. bldg. mat'ls.....$4,200
Call, write or wire: GLADYS HUNTING
DRAKE PERSONNEL
7 W. Madison St. Chicago 2, Ill.

Engineers - Executives - Technical Men
Salaried Positions, $4,000 to $50,000. This Confidential service for men who desire a new connection, will develop and conduct preliminary negotiations without risk to present position. Send name and address for details.
TOMSETT ASSOCIATES
1304-2 Berger Bldg. Pittsburgh 19, Pa.

EXECUTIVES
Interested in Changing Positions
Make use of our continuous nationwide contacts. We offer a unique, confidential & discreet service to Executives desiring to contact employers. Write for details.
Mutual Positions Plan Association
55 William Street New York 5, N. Y.
(A Mutual, Non-Profit Membership Organization)

To EMPLOYERS who advertise for MEN:

Frequently, when there are many applicants for a position, only the most promising letters are acknowledged. The other applicants never know whether their letters reached a prospective employer or not. These men often become discouraged, will not respond to future advertisements and even question their bona fide character.

Every advertisement printed in the Searchlight Section is duly authorized.

You can help keep our readers interested and get better returns to your advertising in this section if you acknowledge each reply—in plain envelopes, if you wish.

Classified Advertising Division
McGRAW-HILL PUBLISHING COMPANY, INC.
"Put yourself in his place."

CHEMICAL PROCESS ENGINEER

Chemical Engineer with minimum of 5 years experience in Petroleum Process Design and thoroughly familiar with and capable of performing process design calculations. Must be a graduate Chemical Engineer. Write, giving full details of training and experience, salary required.

P-2290, Chemical Engineering
330 W. 42nd Street, New York 18, N. Y.

ASSISTANT MANAGER OF CONSTRUCTION
Graduate engineer, wanted by national organization. Must be experienced in all phases of chemical plant engineering and construction, who has no objection to traveling. Give age, education, detailed experience, and salary expected.
Write Box CE-985, Equity
221 W. 41 St., NY 18

HELP WANTED

We'd like to hire a young man (20-35 years old) who has had some experience in selling industrial paints direct to users and original equipment manufacturers. We want a chap who is ambitious, who can work a good bit on his own initiative, and who feels he has the ability to fill a sales manager job some day. A reasonable starting salary to begin with, and an excellent opportunity for growth. Tell us all about yourself in a letter with particular reference to the details of your past experience.

P-2235, Chemical Engineering
520 N. Michigan Ave., Chicago 11, Ill.

PHOSPHORUS PRODUCTION
Chemical engineer experienced in the investigation of phosphorous production problems. Process control and improvement studies in the plant on rotary kiln and furnace operation. Prefer man under 35.

P-2224, Chemical Engineering
330 West 42nd St., New York 18, N. Y.

CONSTRUCTION SUPT.
TECHNICAL SCHOOL OR ENG GRAD,
Wanted By Large Company.
Must be exper. in building & equipment installation. Chemical plant exper. preferred. Man must be free to travel in U. S. Give age, education, detailed experience, and salary expected.
Write Box CE 998, Equity,
221 W. 41st St., N. Y.

Don't forget the
BOX NUMBER
When answering the classified advertisements in this magazine don't forget to put the box number on your envelope. It is our only means of identifying the advertisement you are answering.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

CHEMICAL ENGINEER: Pilot Plant and Development work. Eastern location. 5-8 years experience, preferably man with great initiative, resourcefulness and qualities of leadership. At least M. S. degree desired. Give details education, personal data and salary requirement. P-2134, Chemical Engineering.

CHEMICAL ENGINEER Supervisor: Attractive opening eastern location for pilot plant supervisor with broad organic chemicals. Please submit complete resume and salary desired. P-2126, Chemical Engineering.

YOUNG OR Middle aged electro-metallurgist experienced in electric furnaces for alloy and carbide industry. Replies confidential. P-2208, Chemical Engineering.

SELLING OPPORTUNITY OFFERED

WANTED—SALES Engineers. Large industrial instrument manufacturer requires the services of engineering graduates, preferably with industrial instrument experience in the Chicago, Philadelphia, Pittsburgh, Detroit, Cleveland, and Houston Districts. Good opportunity for men with right experience. Men with pneumatic control and electronic potentiometer experience given special consideration. SW-1987, Chemical Engineering.

EMPLOYMENT SERVICES

SALARIED POSITIONS $3,500-$25,000. If you are considering a new connection communicate with the undersigned. We offer the original personal employment service (40 years recognized standing and reputation). The procedure of highest ethical standards, is individualized to your personal requirements and develops overtures without initiative on your part. Your identity covered and present position protected. Send only name and address for details. R. W. Bixby, Inc., 560 Dun Bldg., Buffalo 3, N. Y.

SALARIED PERSONNEL $3,000-$25,000. This confidential service, established 1937, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. B, 241 Orange St., New Haven, Conn.

POSITIONS WANTED

MECHANICAL ENGINEER. 54, Graduate, desires position as assistant to busy executive in charge of manufacturing of group of plants or single plant, to assume full responsibility for plant rehabilitation, production and reducing operating costs. 30 years experience in chemical and food industries. PW-1409, Chemical Engineering.

CHEMICAL ENGINEER, B. ChE., Vanderbilt, 1948. Scholarship student. Two years experience as Industrial Engineer in a process industry. Prefer production or development work. Married. PW-2232, Chemical Engineering.

(Continued on page 364)

SALES MANAGER—ENGINEER
Experienced Sales Manager, Engineer, previous locations Power Plant and Heavy Industry, East Coast, West Coast, Central United States. Graduate Chemical Engineer, 34, Single. Extensive Experience in Municipal and Industrial Water Conditioning Equipment and Chemicals. Petroleum Refinery Engineering with two large Refiners. Process Equipment Sales. Available immediately. Any U. S. location.
PW-2004, Chemical Engineering
330 West 42nd St., New York 18, N. Y.

POSITIONS WANTED
(Continued from page 363)

ENGINEER-EXECUTIVE: 17 years experience in research, pilot-plant, production and sales in chemical industries. Age 39, married, children. Can offer superior chemical specialty product for the automotive trade. PW-1918, Chemical Engineering.

MECHANICAL ENGINEER—8 years, chemical plant layout, process piping, machine design and maintenance, 7 years diversified and supervisory experience. PW-1884, Chemical Engineering.

MECHANICAL ASS'T Chief Engineer or Chief Draftsman: 37—ASME, IICHE, PE. Diversified design and engineering experience in construction, utilities and process industries. Past 5 yrs. in high executive capacity. PW-1984, Chemical Engineering.

$47,000 EDUCATION Available for investment at low initial interest rates. Chemical engineer with experience in process study and control in competitive manufacturing of inorganic catalyst. Background includes high polymer research techniques, civil service, naval aviator and carrier landing signal officer. All replies will be acknowledged. PW-2043, Chemical Engineering.

STAFF ASSISTANT for planning and policing. Well trained as assistant to president or treasurer where integrity, varied experience, mature judgment and ability to meet people are required. Twenty-five years' experience in expense reduction, methods, accounting and sales. Excellent references. PW-2157, Chemical Engineering.

MECHANICAL ENGINEER, 39, married, experienced as head of technical departments in South American and European Chemical Works, desires to get in touch with reputable concern. Apply OFA 21467 A. Orell Fuessli-Annoncen, Basle (Switzerland).

MECHANICAL DEVELOPMENT Engineer M.E. Cornell Univ., Member A.S.M.E., family, excellent educational and experienced background. 12 years' successful experience including research, development, design, installation, testing of photo-chemical process equipment, together with varied precision machinery, instruments, and structures. Able, experienced liaison, supervision, travel, report writing. Desires permanent responsible position with progressive organization where integrity, varied experience and creative ability will be valued assets. Interested in chemical, pharmaceutical, food, or A-1 supplier to same. Resumé on request. PW-2219, Chemical Engineering.

SELLING OPPORTUNITY WANTED

COMPANY ENGAGED in sale of industrial coal, wants line of industrial chemicals in southeastern territory. Personnel of company have for many years contacted industrial, railroad, and foundry trade. BA-2118, Chemical Engineering.

MANUFACTURERS REPRESENTATIVE

covering Western New York desire agency for instruments. Said handling or process equipment saleable to food, chemical, steel and process industries. Seasoned chemical and mechanical engineers with design and sales experience in their respective fields.

BA-2096, Chemical Engineering
330 W. 42nd St., New York 18, N. Y.

SALES AGENT

Experienced and successful, would like to contact a reliable manufacturer of resins, colors, etc.) who seeks to establish or increase sales with the Paint, Varnish, Putty and allied manufacturers in the Chicago area. Commission basis. Confidential. Address

BA-2116, Chemical Engineering
520 N. Michigan Ave., Chicago 11, Ill.

DESIRABLE FACTORY SPACE

CENTRAL WISCONSIN COMMUNITY desires to acquire new industries and will erect for qualified industry 15,000 to 30,000 square feet of factory space to suit purpose. For further information write

ROWINSKI ENGINEERING
INDUSTRIAL ENGINEERS
RHINELANDER, WISCONSIN

WANTED—SOLVENT

Wastes of All Kinds
REDISTILL OR PURCHASE
Also Surplus Chemicals, Dyes, Pigments, Oils, etc., By-Products, Residues, Equipment
CHEMICAL SERVICE CORP.
80-04 Beaver St. New York 5, N. Y.

COMPLETE CALCINING PLANT FOR SALE
INCLUDING

ROASTERS—4 Herreshoff 14 hearth roasters 22'-2" diameter equipped for oil firing with burners, fans, blowers, and dust collectors. Heat resisting alloys on firing hearths.

Will sell with or without 7 story metal clad frame building 38' x 118' x 78' high.

COOLERS—4—5' x 45' Bicarna-Roger Baker type coolers.

ALSO

FILTERS—2—14' diameter x 18' Oliver Dorrco continuous drum filters, completely equipped including 1—24" x 10" Ingersoll Rand dry vacuum pump.

DRYERS—Ruggles-Coles 90" x 60' Class XF14 oil fired dryers with Clarage draft fans, Hauck oil burners, and 12' diameter Ruggles-Coles cyclone dust collectors.

Above equipment operated approximately two years in good condition and is located at Gabbs, Nevada.

For complete information write, wire, or phone

BASIC REFRACTORIES, INC.
845 Hanna Building *Phone—MAin 3500* Cleveland 15, Ohio

FOR SALE

Steam Tube: Louisville, Allis-Chalmers.
Kettle: 200 gal, Dopp jacketed agitated.
Dryer: Atmospheric Blaken 4x6' single drum.
Dryers: 2 Davenport 8x40' hot air rotary.
Filter Presses: 7", 9½", 8", 10", 12", 24", 30".
Autoclave: 10 gal, Bellevak cast iron.
Pebble Mills: 6x9', 8x8', 4x8', 9½x9½'.
Vacuum Pans: 50 gal, and 6' copper.
Evaporator: Swenson single effect, 120 sq. ft.
Kettles: Stainless Steel—all sizes, (New).
Centrifugal: Rechester 30" suspended.
Mixer: W. & P. 20 gal. jacketed.
Filters: Stokes & Smith double and single.
Centrifugal: 20" Tolhurst stainless steel.
Reactor: 200 gal. Pfaudler glass lined.
Tube Filler: Stokes 80-C automatic and closer.

WE BUY—WE SELL—WE LIST

LOEB EQUIPMENT SUPPLY CO.
1927 W. North Ave. Chicago 22, Ill.

New and Guaranteed Used
Steel PIPE and TUBING
For Every Purpose
New and Guaranteed Used
Steel TANKS
Welded - Riveted - Bolted
For High Pressure; also ordinary storage
Up to 74,500 bbl. capacity
Large stocks carried everywhere for IMMEDIATE SHIPMENT

A. GREENSPON PIPE CO., INC.
(In Business 75 years)
3615 Olive St. St. Louis 8, Mo.
FRanklin 0864 or 1606

AVAILABLE . . .
RECOVERY FACILITIES

All types crude mixtures
DISTILLATION and EXTRACTION
High Temperature High Vacuum
Simple Distillation Difficult Fractionations
Separation of close-boiling Isomers, and azeotropes our specialty
Drum Lots - Tank Cars

TRULAND
CHEMICAL & ENGINEERING CO., INC.
P. O. Box 428, Union, N. J. Unionville 2-7280

DRYER FOR SALE

Link-Belt 10' x 30' Roto-Louvre dryer complete with 10' x 22' air heater, motors, blower, oil burners, dust collector system, compressor, controls, 1947, A-1.

Also, Traylor 8' x 46' rotary tube coolers unused (6); 140' kiln; 1000 KW diesel-electric generators (6).

H. Y. SMITH CO.
828 N. B'way, Milw. 2, Wis.

WANTED •
CHEMICAL PLANT

Large financially powerful diversified organization wishes to add another enterprise to present holdings

CASH PAID
FOR CAPITAL STOCK OR ASSETS
Existing Personnel Normally Retained
Box 1221 1474 B'way, N. Y. 18, N. Y.

DRYER FOR SALE
EXTRAORDINARY BARGAIN

One Link Belt Multi-Louvre Dryer #610. *In Actual operation less than one month!* Perfect condition. Now dismantled in dry storage. Present market value approx. $16,000.00. Will sacrifice for $6,500.00 F.O.B. cars Pittsburgh. Speed 66 F.P.M. Air Heater 990,000 BTU/hr; Cyclone Collector; Exhauster 1710 CFM; Gas Mixer; Combustion Blower; Controls; Motors and Auxiliaries.

CALGON, Inc.
323 Fourth Avenue Pittsburgh, Pa.

Compressors Wanted

STATIONARY - PORTABLE
LARGE OR SMALL
L. W. BAUER
22 Barnett Street Bloomfield, N. J.

TWO INDUSTRIAL BRONZE #90 BUMP PUMPS

new in orig. crates—belt driven by 3 HP 3/60/220-440 Volt drip-proof motor, mounted on caster base—reasonable price.

SELKOFILTER COMPANY
SANDUSKY, OHIO TEL. L.D. #4

SOMETHING TO REMEMBER-

GELB GIVES GREATER VALUE

1—Buffalo Chrome Plated Double Drum Dryer 32" x 90", complete with motor, speed reducer, and conveyor.
2—Buffalo Vacuum Drum Dryers, 24" x 20"
2—Buffalo Vacuum Drum Dryers, 5'10" x 10'.
1—Louisville Rotary Steam Tube Dryer, 54" x 30'
2—Louisville Rotary Steam Tube Dryers, 6' x 50'.
2—Buffalo Double Door Vacuum Shelf Dryers, 12 & 14 Shelves.
3—Buffalo Flakers, 5' x 12'.
2—Block & Clawson Double Drum Dryers, 28" x 5'.

2—Pfaudler 500 gallon glass lined storage tanks (Horizontal).
1—Buffalo Cast Iron Jacketed Kettle, 600 gallons, with mixer.
2—Alloy Fabricators, SS jacketed Reaction Kettles, 170 gallons with agitator and motor.
1—Patterson 5,000 gallon mixing Kettle (New).
1—Glascote 1,000 gallon glass lined Jacketed Reactor (New).
2—Pfaudler Aluminum Jacketed Reactors, 1,300 gallons and 250 gallons (New).
3—Stainless Steel Jacketed Kettles, 2½' x 3'.
1—Steel storage Tank, 10,000 gallons, 1" plate.
2—Steel pressure Tanks, 4' x 11', 200 PSI.
1—Stainless Steel Direct Fired Still, 6' x 6', with coils and agitator.
1—Blaw-Knox jacketed Autoclave, 3' x 4'2" with agitator.
1—Patterson Jacketed Autoclave, 3' x 3'9".
1—Sperry 24" Stainless Steel Filter Press, closed delivery, 12 chambers with hydraulic closing.
2—Sperry SS Filter Presses, 12" x 12", 12 chambers and 15 chambers.
1—Sperry P & F Aluminum Filter Press, 18" x 18".
1—Shriver 42" x 42" Filter Press, 46 chambers with hydraulic closing. Cast-iron.
1—Shriver Bronze plate and frame Filter Press, 18" x 18", 18 chambers.
1—Sperry Rubber-lined Filter Press, 12" x 12", recessed type, closed delivery.
1—Sperry 24" x 24" Filter Press, closed delivery, 12 chambers.
3—Shriver P & F Laboratory Filter Presses, 7" x 7".
1—Shriver 30" x 30" closed delivery filter press, 28 chambers.
1—Shriver 36" x 36" closed delivery filter press, 48 chambers.
1—Shriver 36" x 36" Filter Press, closed delivery.
1—Vallez #3 Filter.
1—Sperry 36" x 36" Recessed Type Filter, center feed, open delivery, 42 Heresite covered plates.
1—Bartlett & Snow direct fired Kiln, 8½' x 50'.
1—Ruggles Cole direct fired Kiln, 7' x 60'.
1—Banbury Mixer #1 with 50 HP motor.
4—Baker Perkins Jacketed Vacuum Type Double Arm Mixers, w/motors and drives, 100-gals.
3—Cavagnarro Vacuum type Double-arm Mixers w/motors and drives, 600# capacity, stainless steel.
1—J. H. Day dble. arm, jacketed Mixer, sigma blades, 500 gals.
3—J. H. Day dble. arm, jacketed Mixers, 50 gals., sigma blades.

THE GELB GIRL—FEBRUARY 1950

3—Pfaudler Glass-Lined Tanks, 300, 500 & 1000 gals.
3—Glascote Glass-Lined Storage Tanks, 200, 300 and 500 gallons.
1—Plate Fabricator, jacketed Kettle, 900 gallons, 125 PSI (ASME)
1—Steel Jacketed Kettle, 7'3" x 7'.
1—Cast Iron Jacketed Kettle, 300 gallons.
1—Pfaudler glass lined Jacketed Kettle ASME code 6' dia. x 9' long.

1—Baker Perkins dble. arm jacketed Mixer, 200 gals., sigma blades.
5—Baker Perkins dble. arm Mixers, 200 gals., sigma blades.
1—J. H. Day Lab. Type Mixer.
1—Patterson nickel lined Blender, 192 cu. ft. cap., w/20 HP motor.
2—J. H. Day Mogul type Mixers, 2½ gallons and 5 gallons.
5—Simpson #0 Intensive Mixers (New).
1—Bird Suspended type Centrifuge, 40" Stainless Steel perforated basket, with motor.
1—Tolhurst Suspended type Centrifuge, 40" rubber perforated basket, with motor.
1—Podbielniak SS Centrifugal Extractor, Model 6080.
10—Sharples Super Pressure Centrifuge, with 3 HP Expl. proof motors.
1—Sharples Super Pressurite Centrifuge, SS Bowl, Model 18V.
1—A T & M Suspended type Centrifuge, 30" SS perforated basket, with motor.
1—Tolhurst Suspended type Centrifuge, 26", SS perforated basket, with motor.
1—Royle #1 Perfected Extruder, with heating unit.
1—Allis Chalmers Ball Mill, 5'8" x 18', Silex lined.
3—Hardinge Conical Ball Mills, 8' x 30", 5' x 22", 6' x 22".
1—#6 Mikro Atomizer, Stainless Steel, w/20 HP motor.
1—Mikro Pulverizer, #2TH.
1—Mikro Pulverizer, #1SH.
1—Ball & Jewell Rotary Cutter, #½.
1—Ball & Jewell Rotary Cutter, #2.
1—Ball & Jewell Rotary Cutter, Lab. Type.
3—Orville Simpson Rotex Screens, #41.
2—Stainless Steel Double Pass Condensers, 184 and 572 sq. ft.
1—Swenson-Walker Rubber-lined Crystalizer.
8—Swenson-Walker Rubber-lined Jacketed Crystalizers, 2 ft. x 2 ft. x 20 ft. sections.

Established 1876

R. GELB & SONS, Inc.,

CHEMICAL, RUBBER, OIL, PLASTIC and FOOD PROCESSING MACHINERY

STATE HIGHWAY No. 29, UNION, N. J. · UNionville 2-4900

MONEY MAKING MACHINERY — BUY BRILL

FILTERS

1—Sweetland #7 with 20- 20" dia. leaves.
1—Sweetland #2 all stainless with 12 S. S. leaves.
1—Oliver Rotary Vac. 8' x 12', 9' x 9'.
1—Oliver Top Feed Rotary Vac. 9' x 9'.
1 Elmo Rotary Vac. 4' x 6', stainless.
1—Sharples 18" x 12" P&F, 12 chambers, C. I.
1—Sharples 18" x 24" Diamond, 36 chambers C. I.
1—Kelly 48" x 48" P&F, 48 chambers, C. I.
15—Shriver, Sherry Shriver, 18" to 42".

SCREENS

1—20" x 48" Rotex single deck.
1—Rotex #20 Double Deck 48"x120", all stainless.
1—Day #181 Single Deck 24"x60", 60°x84".
6—Tyler Hummer 4'x10', 4'x5', 3'x10', 3'x10', 5'x5' with thermionic units.

CENTRIFUGALS

6—AT&M 42" & 40" Suspended, S. S. imperforate baskets, bottom discharge.
1—Bird 42" Suspended, solid steel basket.
1—Tolhurst 60" center slung S. S. perforated.
1—Tolhurst 60" center slung steel basket.
1—AT&M 30" Suspended, hercnite perforated basket.
2—AT&M 20" rubber-covered basket.
1—Bird Continuous 18" x 20" solid wound bowl.
1—Sharples #16, Stainless Steel, 2 HP motor.
1—Sharples #6, Steel, 2 HP motor.

DRYERS—KILNS

10—Rose Eng. 2 Trough Atmospheric Dryers, steam heated, 250 sq. ft., complete.
2 Proctor & Schwartz 10 and 9 section Single Conveyor Dryers.
6—Buflovak 32" x 108", 40" x 72", 32" x 72", Atmospheric Double Drum.
5—Buflovak 5' x 12', 5' x 4', 4' x 6', 4' x 9' Atmospheric Single Drum.
6—Allis Chalmers Kilns 9'0" x 250', 9' x 60', 7'9" x 120', with drives.
1—Bartlett & Snow 6' x 42' Kiln.

FLASH!

2—Shriver 36" Washing type P&F cast iron filter presses.
2—Sharples 36" and 24" Washing type P&F cast iron filter presses.
1—Sharples 24" filter press, new wood plates and frames.
2—Sweetland #12 filter presses.
2—Sweetland #7 Stainless Steel filter presses.
1—Bird 10" x 20" continuous Centrifuge, Stainless Steel
1—Oliver 3' x 7' Vac. Rotary Filter.
1—Fletcher 48" suspended S.S. Centrifugal bottom discharge.
1—Bird 48" suspended S.S. Centrifugal bottom discharge.
1—Baker Perkins 100 gal. Stainless Steel Shredder.
1—Sanitary 600 Mixer with 10 HP motor and turned feed fabrication.

1—Bartlett & Snow 4' x 45' Jacketed Cooler.
6—Buffalo-Cabin Special Class XC-10 Steam Tube Dryers, 700's' x 40' long.
1—Devine 5' x 14' S. S. clad Rotary Dryer.
1—Devine 523 Vac. Shelf, 13—60" x 78" Cabinets.
1—Stokes, Devine Rotary Vac. 1½' x 5', 3' x 15', 4' x 30'.
1—Spray Dryer, Stainless Steel, 8' chambers.

PULVERIZERS—MILLS

1—Williams Titan S-roll High Side Mill with 5' screw separator, 9' cyclone, 5' collector, ducts.
1—Patterson 6' x 8' Jacketed Pebble Mill.
1—Patterson 5' x 6', 5' x 4' Jacketed Ball Mills.
1—Patterson 4' x 5' silex-lined Pebble Mill.
1—Rodgers 3' x 4', 3' x 3' Pebble Mills.
2 Abbe, Eureka #3 Ice Mills.

Partial List Only—Catalogs, Quotations furnished on request.

4—Mikro Pulverizers #4TH, #2TH, #1SH.
2—Jeffrey 36" x 60", 30" x 24" Hammer Mills.
1—Jay Bee Type U.S. Hammer Mill.
1—Williams 18" x 20" Standard Hammer Mill.
3—Bell & Jewell #1, #2 and #2½, Rotary Cutters.
2—Raymond #10 and #50 Imp Mills.

KETTLES—EVAPORATORS

1—Pfaudler 500 gal. glass-lined, jacketed, agitated Reactor.
5—Stainless Steel 7'6" x 8'6" jacketed, agitated Reactors, 2600 gal. each.
3—Dopp Jktd., agitated Kettles 150, 250, 400 gal.
1—Steel 750 gal. jacketed, agitated Kettle.
6—Glass-lined Storage Tanks 20 to 500 gal.
8—Stainless Steel Storage Tanks 4-8-, 10,000 gal.
3—Pfaudler 750 gal. glass-lined Tanks.
10—Steel Horizontal Tanks, 10,000 to 20,000 gal.
6—Copper Vacuum Stills or Pans, 75 to 500 gal.
1—Copper Rectifying Column & Beer Still, 30" dia.

MIXERS—ALL TYPES

2—Baker Perkins 100, 4½-gal. jacketed Double Arm Vacuum Mixers.
4—Baker Perkins 150, 100, 50-gal. jacketed Double Arm Mixers.
2—Baker Perkins Double Arm 1 & 2 gal. Mixers.
1—Day #3 Cincinnatus, jacketed, Double Arm.
10—Day, 100 Lb. to 2000 Lb. Powder Mixers.
1—Wolf 4000 lb. Steel Powder Mixer.
1—Robinson 1000 lb. jacketed Powder Mixer.
8—Rodgers 400 lb. to 2000 lb. steel and stainless steel Powder Mixers.
25—Electric Portable Agitators ¼ HP to 5 HP.

MISCELLANEOUS

2—Buflovak 6' dia. Crystallizers.
2—Knapp, Automatic Can Laborers to #10 cans.
2—Colton #4 worm style Tube and Jar Fillers.
1—Knapp #429 Carton Sealer w. compression belt.
1—Rodgers auger type Powder and Paste Filler.
1—Anderson #1 Expeller, 15 HP.
1—Nash Hytor Vacuum Pumps to 300 cfm.
6—Orbits acid-proof Cent. Pumps, 2"x1½", 5 HP.

BRILL EQUIPMENT COMPANY

2401 Third Ave.,
New York 51, N. Y.
Tel. Cypress 2-5703

GET QUALITY WITH AMERICAN — THE BEST IN REBUILT COMPRESSORS — SAVE 40% TO 60%

STATIONARY

CFM	Max. Pres.	Size	Make
38	100	4x4	INGERSOLL ER1
44	110	4x4	INGERSOLL ER1
44	100	5x5	INGERSOLL ER1
44	110	6x5	AM-IR-PA-WORTH
60	125	4x6	IR-CPT
99	250	6-3/4x6	INGERSOLL ER2
99	90	7x6	INGERSOLL ER1
99	100	7x6	AM-CPT-IR
100	100	7¼x6	CHICAGO NSB
100	70	8x6	IR-PA
100	100	7¼x7	WORTHINGTON HB
100	100	7¼x7	AMERICAN AP1
136	125	8x8	CPT-IR
136	40	8x8	PA-IR
161	90	8x7	WORTH HB
173	100	9x8	IR-CPT-SULLIVAN
258	50	10x8	IR-PA
258	125	10x10	IR-CPT
278	15	12x8	IR
278	65	11x10	WORTHINGTON
278	100	12x10	IR-CPT
350	125	12x10	WORTHINGTON
366	100	12x10	IR-CPT-PA
384	100	12-7/8x10	PENN
384	100	13x10	CPT-IR
466	100	11¼-7x7	CHICAGO Y-CM
520	100	14x13	IR-CPT-GD
578	50	16x10	PENN
868	40	16x10	PENN
870	125	15-9½x13	INGERSOLL XCD-2
877	125	17-10¾x14	INGERSOLL XCD-2

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60 CFM—CPT-IR-Worthington
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210 CFM—Gardner Denver (Gas) 4 Pass
210 CFM—Worthington (Gas & Diesel)
315 CFM—Worthington (Gas) 4 Pass
315 CFM—Le-Roi (Gas) 4 Pass
315 CFM—Chicago (Diesel) 6 Pass
315 CFM—Ingersoll (Diesel) 6 Pass
500 CFM—Worth—Chicago

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47 CFM—Worth—Two stage
134 CFM—Worth—Single stage
200 CFM—Worth (Vertical) 12 x 8
354 CFM—IR-Penn—14 x 8
1080 CFM—Ingersoll Rand ERI 22 x 8
8925 CFM—Ingersoll 22 x 14

SPECIALS

CFM	Pressure	Make	Model
29.5	250	Worth	BW300
60	1000	IR	Type 30
61	1000	Worth	VS
105	350	CPT	T-CB
110	1000	IR	Type 60
140	125	Gardner Denver & Sullivan	WB and WL-60
178			
230			
285			
335	125	Worth	M-70
1610	119	IR	XRE
1296	125	Worth	VD
1692	70	Penn	DB1
2560	125	CPT	W-CE

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1—39" x 39" Kilby Cast iron plate and frame Filter Press, 47 chambers, 1" cake.

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1—Sweetland Filter, No. 5, 19 leaves.
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Hardinge Mills—4'x22" ball, 6'x48" Air Swept, Raymond Mills.
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Roll Crusher Sturtevant 16"x10" smooth
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3 Stainless Steel T347 Spray Towers or Oxidation Tanks, 14 gauge, 32" dia. x 17' high, approx. 750 gal.

3 Bartlett & Snow Co. Stainless Steel T347 Reaction Kettles, approx. 1000 gal; 8' dia. x 2' deep, dished bottom, open top with flat bolted cover; direct fired, gas burners available; heavy duty agitator with bearings, spur gear drive, Cleveland worm gear reducer and 25 HP 3/60/220-440 4-speed motor

2 Spencer Turbine Co. Gas Boosters or Compressors, 800 CFM @ 80 oz. sp., Stainless Steel T347 contact parts, 50 HP 3/60/220-440/2450 enclosed motors

2 Sharples #16V Vaporite Super Centrifuge, dual purpose bowl, stainless steel T304 bowl, covers and other contact parts

3 Stainless Steel T347 Tanks, 3450 gal., 9' dia. x 7'3" deep, ¼" metal, flat bottom, flat bolted top with stainless flanges and bolts; 2" stainless pipe coils in each tank

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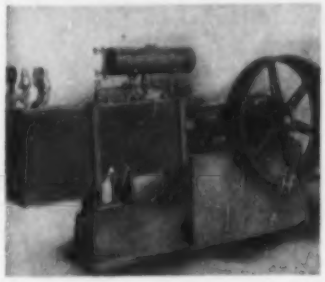

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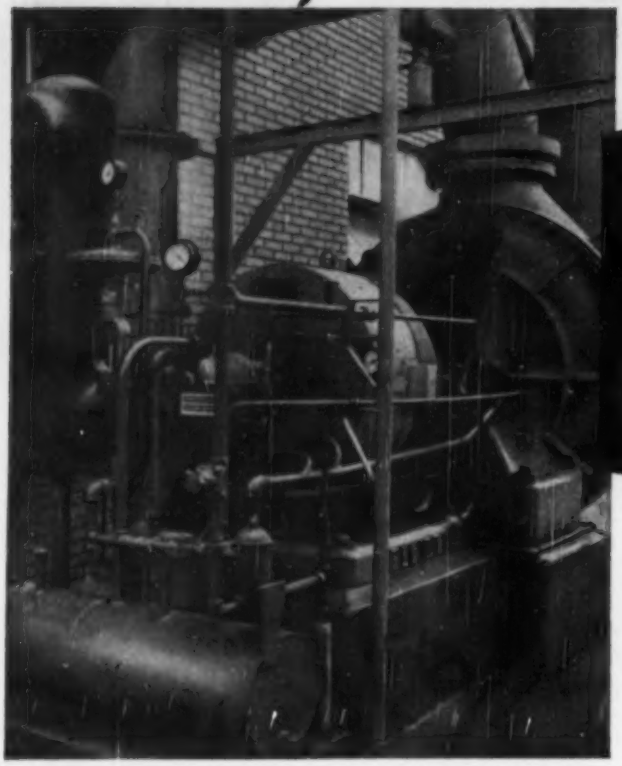

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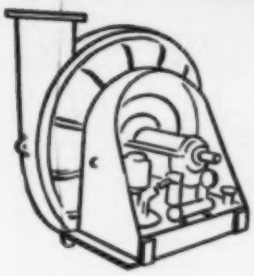

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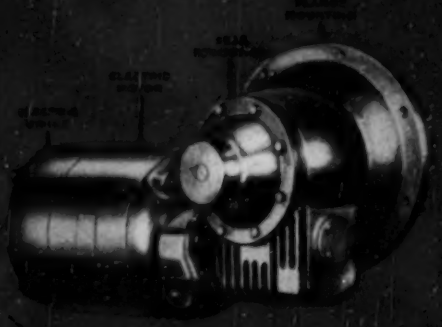

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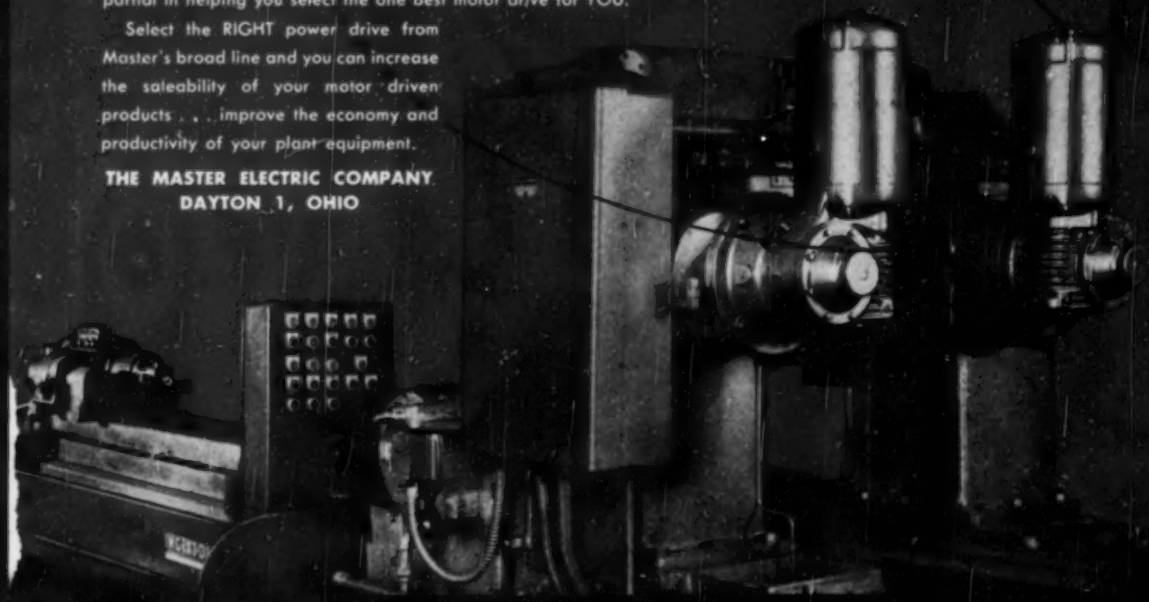

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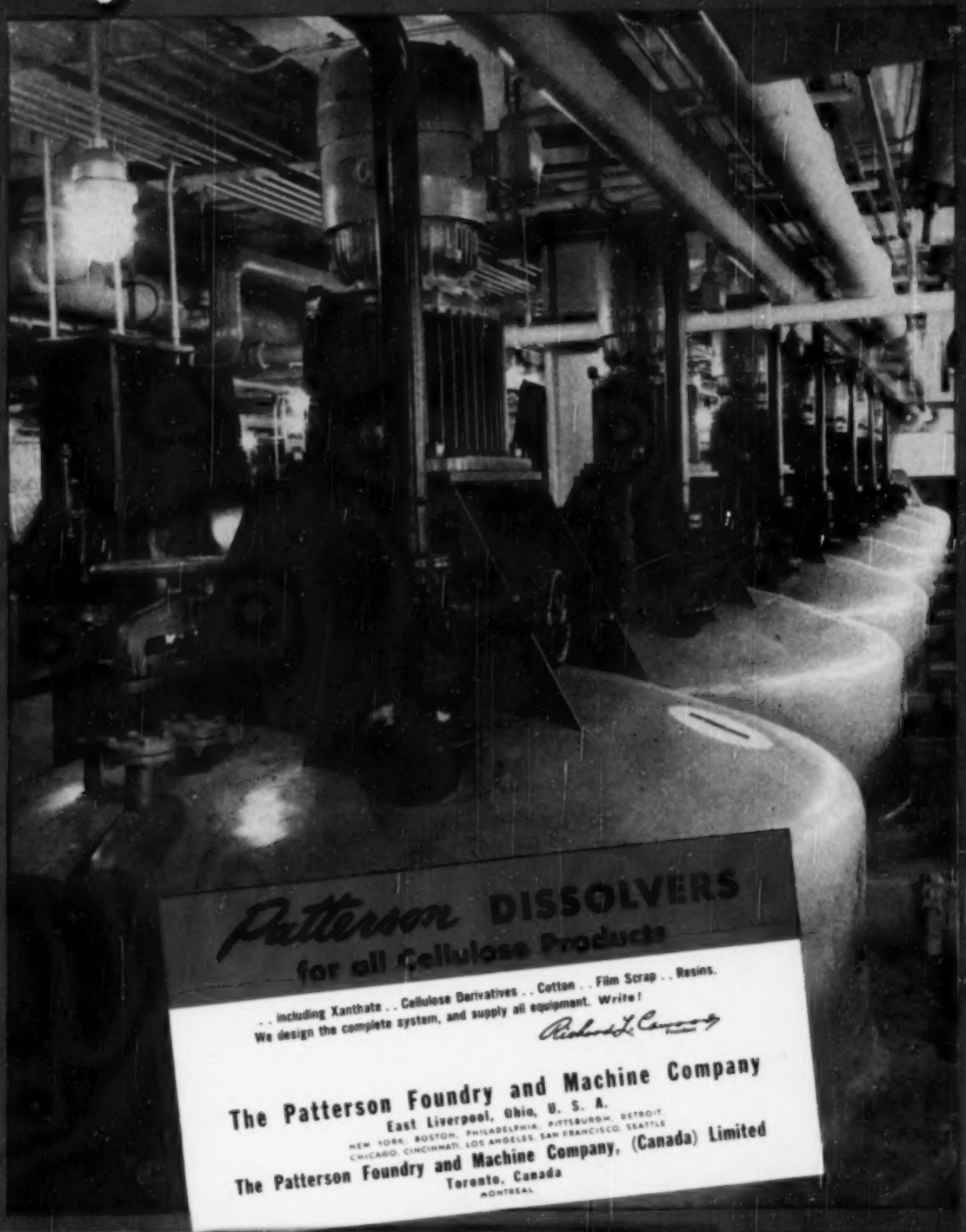

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